

O0120-013A-13
June 10, 2021

Christopher McGoldrick, Town Planner
Grafton Municipal Center
30 Providence Road
Grafton, MA 01519

Re: **Village at Grafton Woods, 8 Pine Street
Plan Approval Application - Peer Review Response to Comments 2**

Dear Chris:

Tighe & Bond has received a second round of peer review comments for the Village at Grafton Woods Project located at 8 Pine Street in Grafton, Massachusetts. The project was submitted for Planning Board Review under Section 13 of the Grafton Zoning Bylaw in February 2021. Initial peer review comments were provided Graves Engineering, Inc. (GEI) in a letter dated April 6, 2021. Our response to those comments were provided in a letter dated April 30, 2021. GEI provided follow-up comments in a letter dated June 3, 2021. The following lists the outstanding review comments per GEI's letter in italics, with Tighe & Bond's responses in bold lettering.

Zoning By-Law

7. The plans should include a sheet with vehicle turning template for the Grafton Fire Department's largest vehicle (Tower 1) superimposed to demonstrate vehicle maneuverability around the buildings. Of particular concern is maneuverability around the easternmost building corner: the inside curb radius is 20 feet, the outside curb radius is 40.5 feet, and the building corner and guard rail will be impediments to maneuverability. (§13.7.C.4.z.v).

T&B Response 4/30/21: Fire apparatus turning movement information is provided on the attached Figure 1.

GEI Response 6/3/21: A supplemental sheet (in Attachment B) was included in the bound document entitled Village at Grafton Woods, 8 Pine Street, Plan Approval Review – Peer Review Response to Comments dated April 30, 2021. Figure 1 shows that the fire truck should be able to maneuver around the easternmost building corner if a rear tire of the fire truck mounts the curb. GEI defers to the Fire Department if the modeled turning maneuver is acceptable. GEI recommends that the Planning Board include a condition in its decision that allows the Fire Department to test the constructed accessway and, if necessary, require modifications to address access deficiencies prior to issuance of an occupancy permit.

T&B Response 6/10/21: We note that the curbing around the rear of the residential building is flush with surrounding grade and serves as a demarcation of the 20' wide grass turf emergency access way. The Fire Department has had the opportunity to review the turning maneuver figure and has signed off on the project. However, the Applicant does not have issue with a potential condition of approval allowing the Fire Department to test the construction accessway and, if necessary, require modifications, prior to issuance of an occupancy permit.

Hydrology & MassDEP Stormwater Management

20. Soil testing needs to be performed at the proposed locations of the stormwater infiltration facilities to demonstrate that the required groundwater offset will be achieved and that the subsurface conditions are suitable for infiltration.

T&B Response 4/30/21: A comprehensive boring and test pit program was conducted in October 2020 and January 2021 to evaluate subsurface soil and groundwater conditions on the property. At that time, subsurface infiltration locations were not determined. Test pit and boring locations are provided on Sheets C-100, C-101 and C-102 of the Site Plans. Confirmation of soil textures and groundwater elevations within each infiltration practice will be determined prior to construction. We request the Board consider a condition of approval to confirm groundwater elevations within the boundaries of each infiltration system prior to construction.

GEI Response 6/3/21: Sheet C-100 was revised to include groundwater readings at various borings. Groundwater was measured at depths of five feet to 12.5 feet below the ground surface for those borings 20 feet or deeper. Groundwater was not encountered for borings less than 10 feet deep. Data at boring TB-1 indicates that groundwater is higher than the bottom of the (subsurface) Infiltration System 1 and data at boring TB-7 indicates that groundwater is higher than the bottom of (subsurface) Infiltration System 3. Considering the depth of the subsurface infiltration BMP's below the existing ground surface, GEI recommends that soil testing be performed at the infiltration BMP's, including the open basin, during permitting rather than prior to the start of construction.

T&B Response 6/10/21: Considerable time and expenses have been expended since August 2020 to document subsurface conditions for both environmental remediation efforts and building construction designs. Since the Applicant does not yet own the property, we request that the Board consider a potential condition of approval to require additional subsurface explorations during building demolition if the project continues to progress.

We note that the subsurface units proposed are large (60-inches in height), and smaller chambers (down to 16-inches in height) can be used in place should groundwater elevations prove to impact design. It is our opinion that enough flexibility is allowed in the current design to accommodate any impact that groundwater elevations within the specific footprint of each infiltration system, and that substantial changes will not be required as a result of the additional subsurface explorations.

Should the results of additional subsurface explorations require consider modification to the stormwater management system and site development proposal, amended permits will be requested by the Planning Board and the Conservation Commission.

General Engineering Comments

30. Sheet C-106 has erosion control barriers only proximate to the wetlands. Erosion control barriers need to be provided at all down-gradient sides of the work on Sheet C-105 and C-106.

T&B Response 4/30/21: The Site Plans have been revised to include erosion control barriers at all downgradient limit of work lines.

GEI Response 6/3/21: GEI could not find symbols or lines for the proposed erosion control barriers on Sheets C-105 and C-106. It appears that the AutoCAD layer for erosion control barriers was accidentally turned off.

T&B Response 6/10/21: Linework in the AutoCAD file did not appear properly when the sheets were printed. Revised plan sheets C-105 and C-106 are attached showing erosion and sedimentation control barriers along the limit of work.

Additional Comments; June 3, 2021

38. Pertinent elevations (e.g. bottom of stone, bottom of chambers) need to be provided on the plans for the subsurface infiltration systems.

T&B Response 6/10/21: Revised detail sheet C-507 has been revised to include pertinent design elevation data for each subsurface infiltration system. Detail sheets are attached to this letter.

39. Proposed SMH 6 should be labelled as a drop manhole. GEI defers to the Grafton Sewer Department whether interior or exterior drops are required; in either case a construction detail should be added to the plans.

T&B Response 6/10/21: The Grafton Sewer Department requires an internal drop. Notations have been revised on Sheet C-107, and a detail has been provided on Sheet C-509, both attached to this letter.

40. Groundwater mounding calculations will need to be provided for any stormwater infiltration BMP that has less than four feet of groundwater offset and will attenuate the peak discharge from a 10-year or more intense storm event.

T&B Response 6/10/21: Please refer to the response to Comment 20 above. Groundwater mounding calculations will be provided upon results of additional subsurface investigations.

41. GEI has no issues relative to compliance with the Regulations for the Administration of the Grafton Wetlands Protection Bylaw except as noted in Comments #20 (Grafton Wetland Regulations §V.B.3.m) and #42.

T&B Response 6/10/21: Comment acknowledged.

42. The top of the berm at the open infiltration basin will only be 3.5 feet wide at elevation 411.75 (the 411-foot contours are eight feet apart and the slopes are 3H:1V). The needs to be wide enough for maintenance equipment. (Grafton Wetland Regulations §V.B.5.h.ii)

T&B Response 6/10/21: Access to the basin for maintenance will occur from the Pine Street side which does not include a vegetated berm. The berm has been revised to provide a 10-foot width along the 411.75 elevation. This resulted in minor adjustments to the infiltration basin sizing, provided in the attached revised HydroCAD report. Revised drawdown calculations for the basin are attached to this letter.

The modifications to the basin result in the following design elevations:

- **Peak Water Elevation – 100-year storm event = 4410.24'**
- **Emergency Spillway Elevation = 410.75'**
- **Top of Berm Elevation = 411.75'**

No other modifications to the storm drainage analysis were made, therefore the following revised peak discharge rate and runoff volume summaries are presented for Point of Analysis 1 (i.e. wetland area).

Table 1 Peak Discharge Rates		2-Year Storm Event	10-Year Storm Event	100-Year Storm Event
Point of Analysis 1	Existing	6.62 cfs	13.80 cfs	32.85 cfs
	Proposed	5.34 cfs	13.62 cfs	37.74 cfs

Table 2 Runoff Volume		2-Year Storm Event	10-Year Storm Event	100-Year Storm Event
Point of Analysis 1	Existing	0.705 ac-ft	1.449 ac-ft	3.509 ac-ft
	Proposed	0.438 ac-ft	1.093 ac-ft	3.419 ac-ft

The project continues to attenuate both peak discharge rate and runoff volume to Point of Analysis 1.

43. GEI has no issues relative to compliance with the Town of Grafton Conservation Commission Regulations Governing Stormwater Management except as noted in Comment #20 (Grafton Wetland Regulations §6.A)

T&B Response 6/10/21: Comment acknowledged.

We trust this information will be satisfactory in your review of the Village at Grafton Woods project. Should you have any questions or need additional information, please contact me at 413.572.3238 or jechristy@tighebond.com.

Very truly yours,

TIGHE & BOND, INC.



Jean E. Christy, PE
Senior Engineer

Attachments: Revised select plan sheets (C-105, C-106, C-107, C-507, C-509)
Revised Proposed Conditions HydroCAD
Revised Basin Drawdown Calculation

Copy: GSX-ODG, LLC (w/o encl)
Jeffrey Walsh, Graves Engineering (w/ encl)
Grafton Conservation Commission (w/ encl)

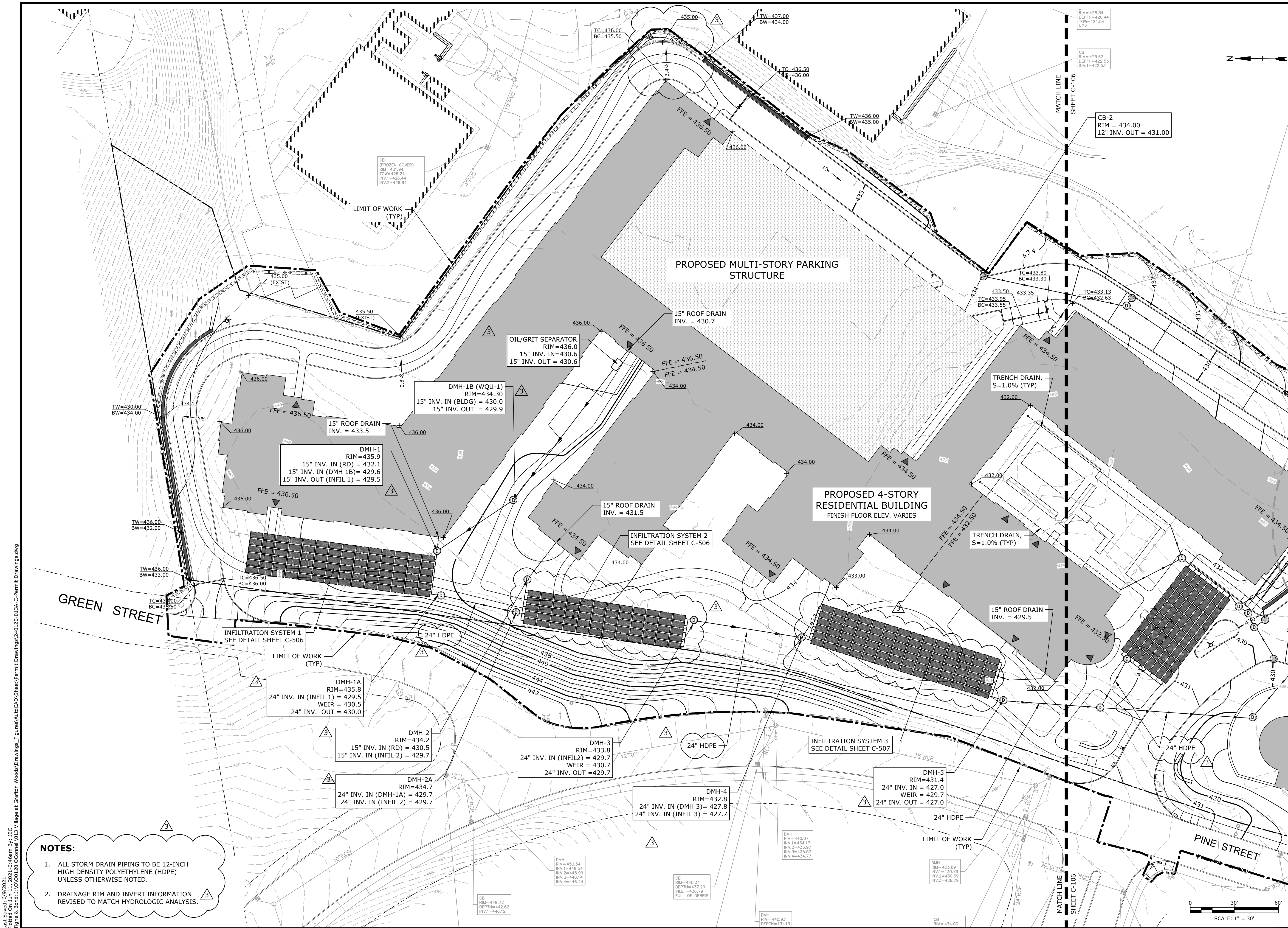
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Grafton,
Massachusetts

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1	2/26/2021	PERMIT SET	
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DATE:		JANUARY 2021	
FILE:		240120-013A-C-Permit Drawings.dwg	
DRAWN BY:		SO / TJG	
CHECKED BY:		KM	
APPROVED BY:		FJH	

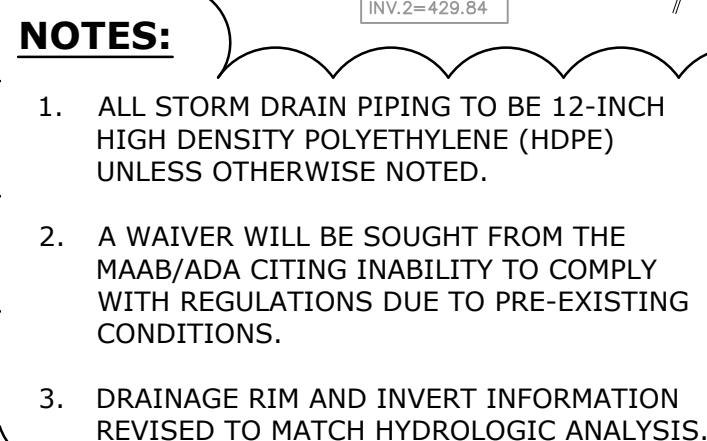
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C-105



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2	3/30/2021	REVISED PERMIT SET
1	2/26/2021	PERMIT SET
MARK	DATE	DESCRIPTION
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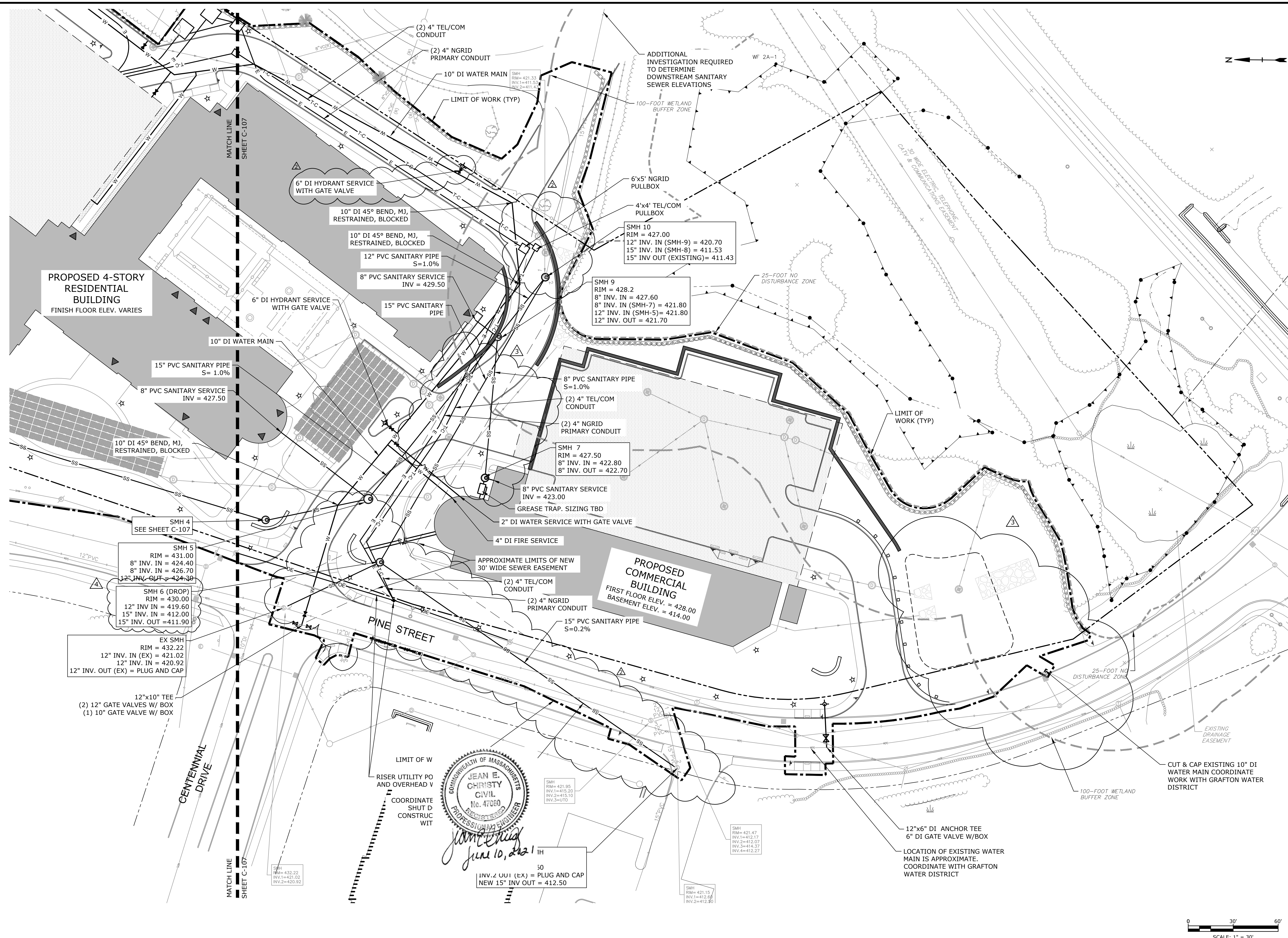
C-106

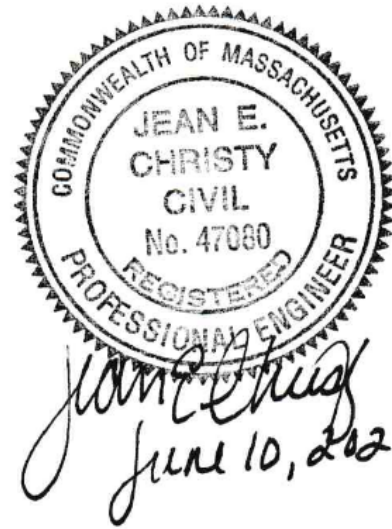


Grafton,
Massachusetts

4	6/10/2021	PEER REVIEW COMMENTS
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2	3/30/2021	REVISED PERMIT SET
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C-108





PERMIT SET -
NOT FOR
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Village at
Grafton
Woods
8 Pine Street

GSX-ODG, LLC

Grafton,
Massachusetts

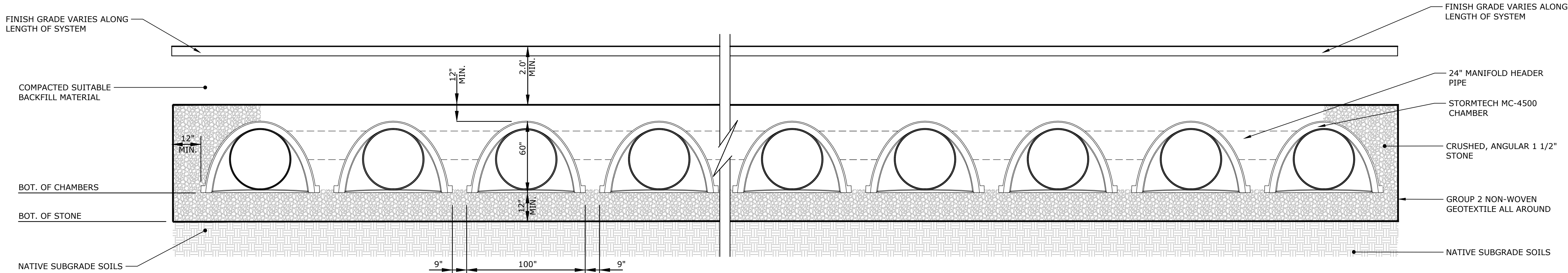
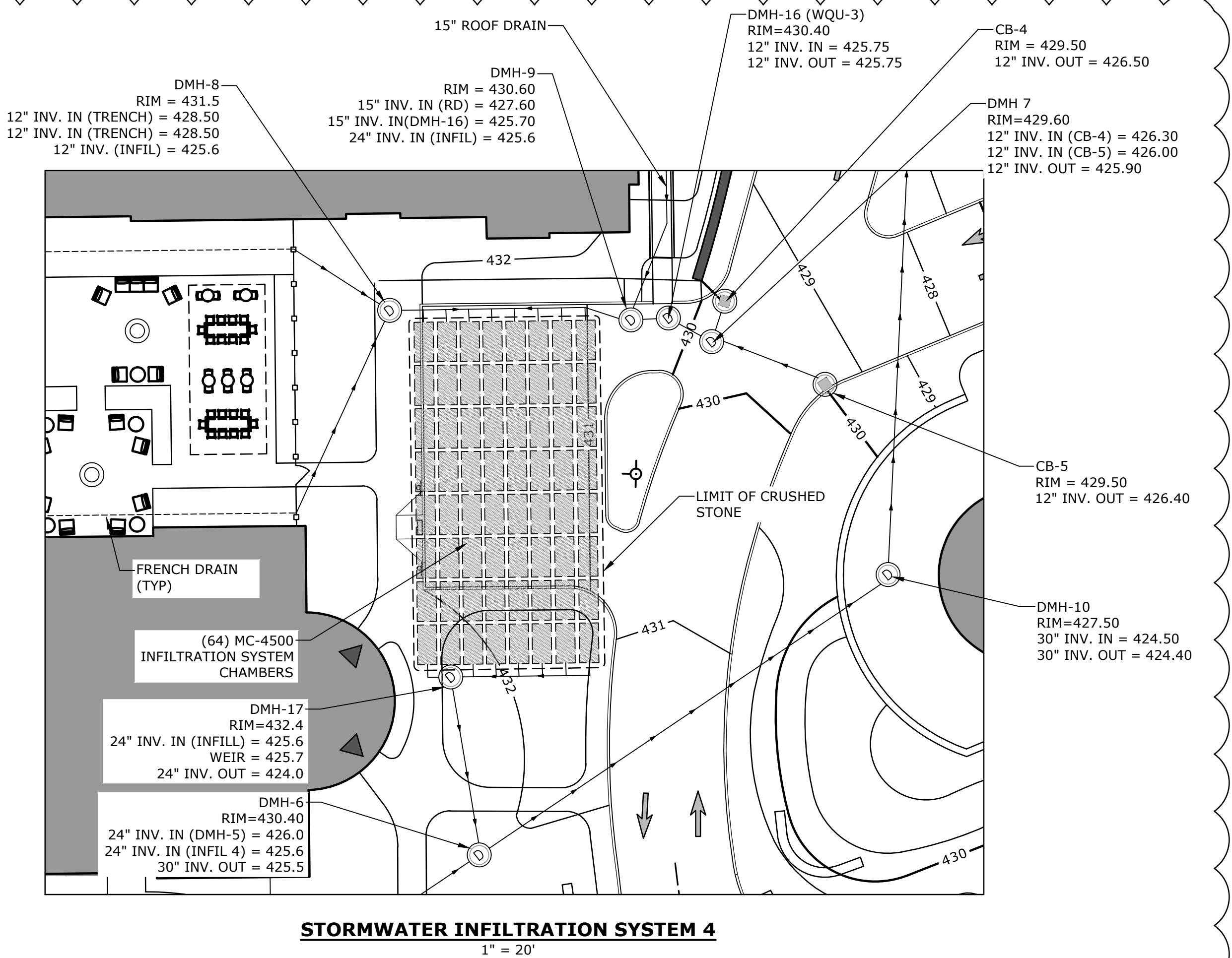
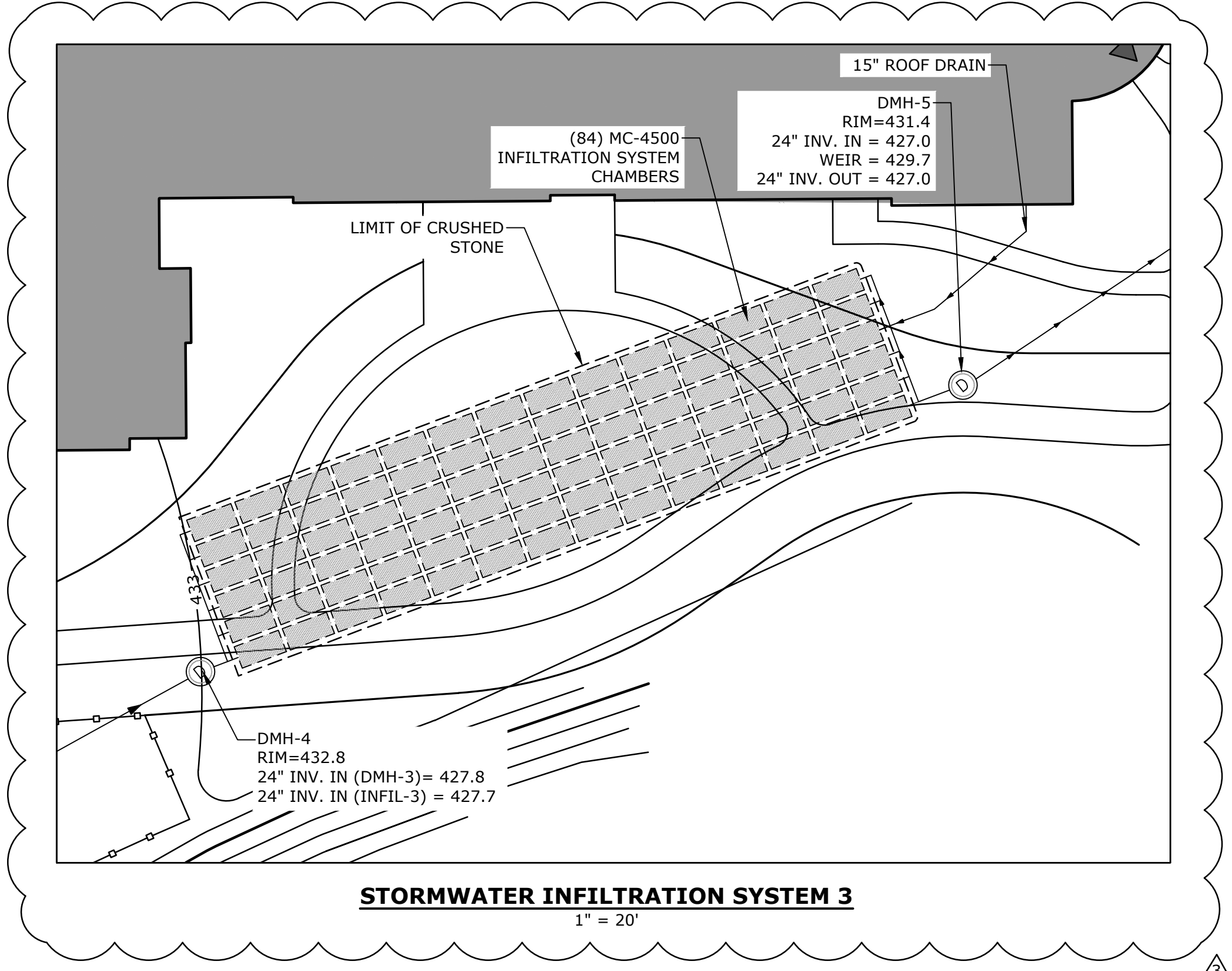
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1	2/26/2021	PERMIT SET

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DATE: JANUARY 2021
FILE: 240120-013A-C-Permit Details.dwg
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SITE DETAILS - 7

SCALE: AS SHOWN

C-507

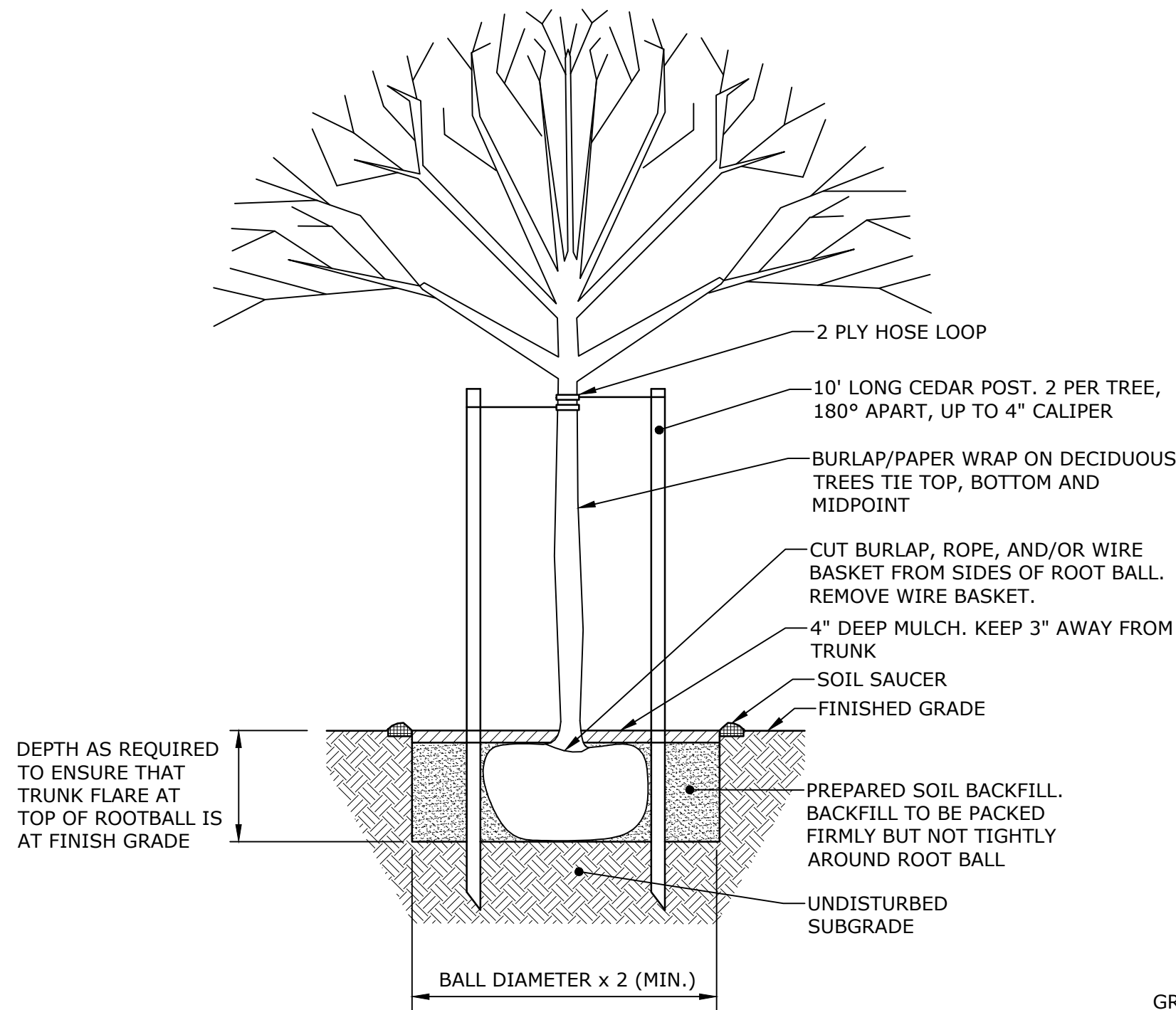


STORMWATER INFILTRATION SYSTEM - TYPICAL SECTION

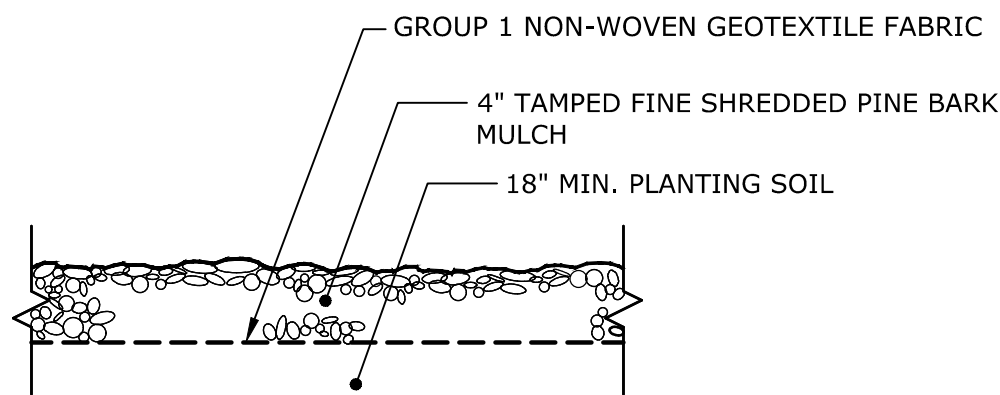
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INFILTRATION SYSTEM DATA TABLE				
SYSTEM NUMBER	INFILTRATION SYSTEM 1	INFILTRATION SYSTEM 2	INFILTRATION SYSTEM 3	INFILTRATION SYSTEM 4
NUMBER OF CHAMBERS	84	60	84	64
BOTTOM OF STONE ELEVATION	427.65	425.5500	423.95	419.95
BOTTOM OF CHAMBER ELEVATION	428.40	426.3000	424.70	420.70

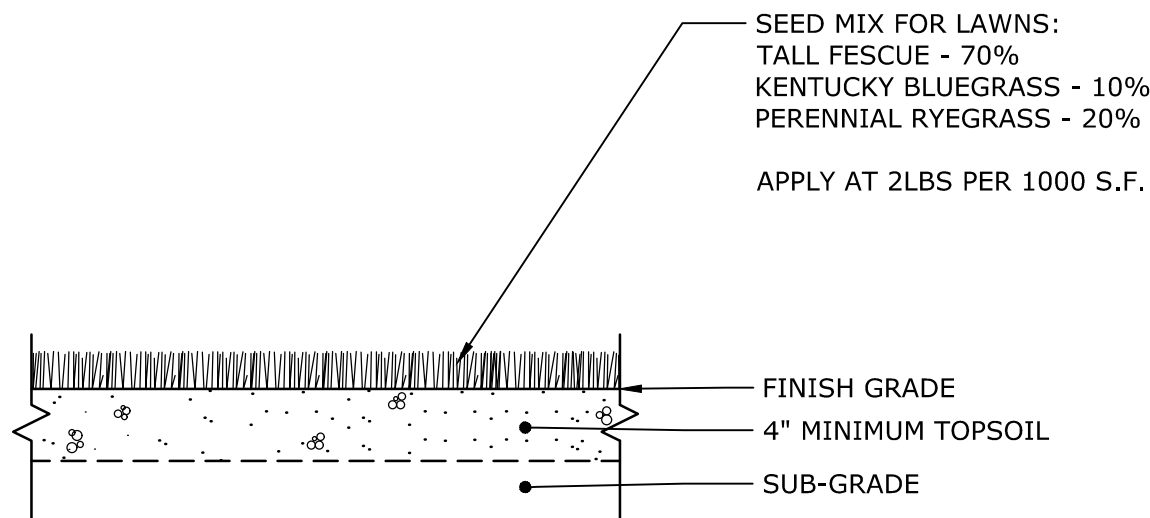
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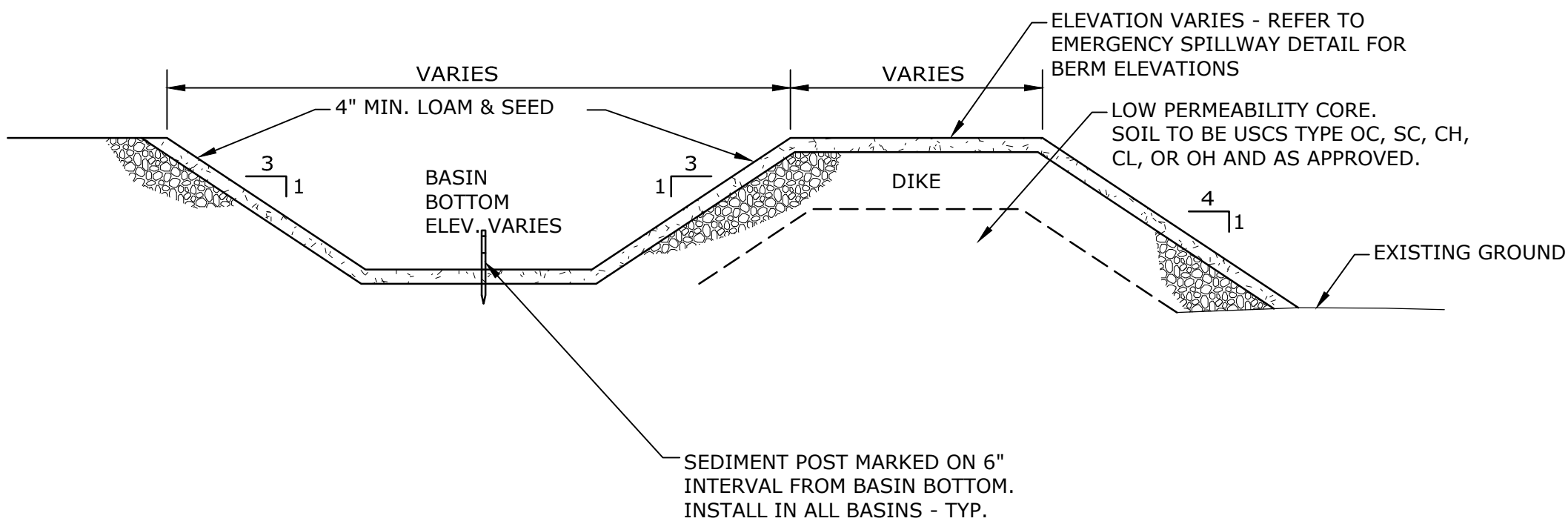
TREE PLANTING DETAIL
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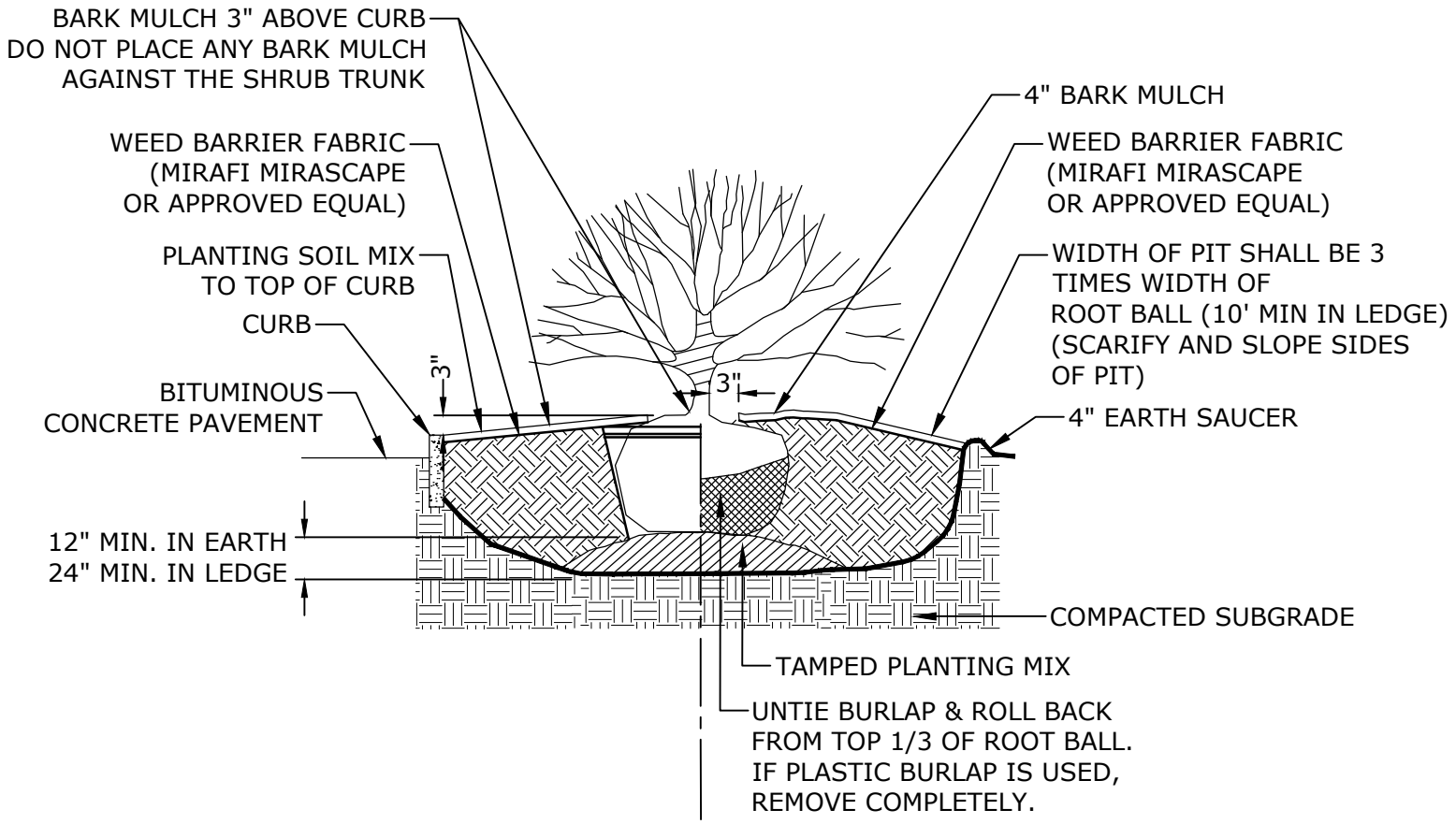
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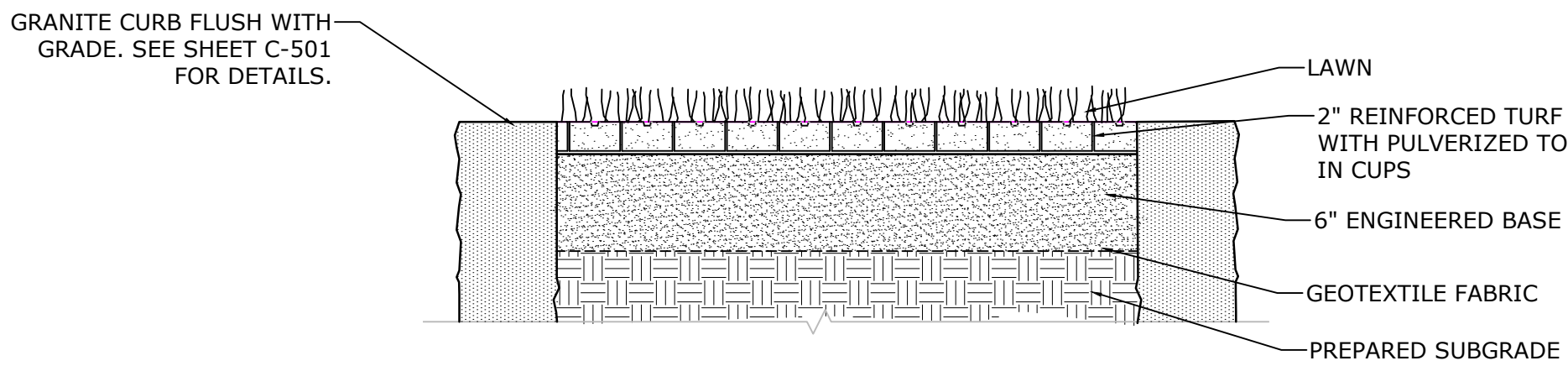
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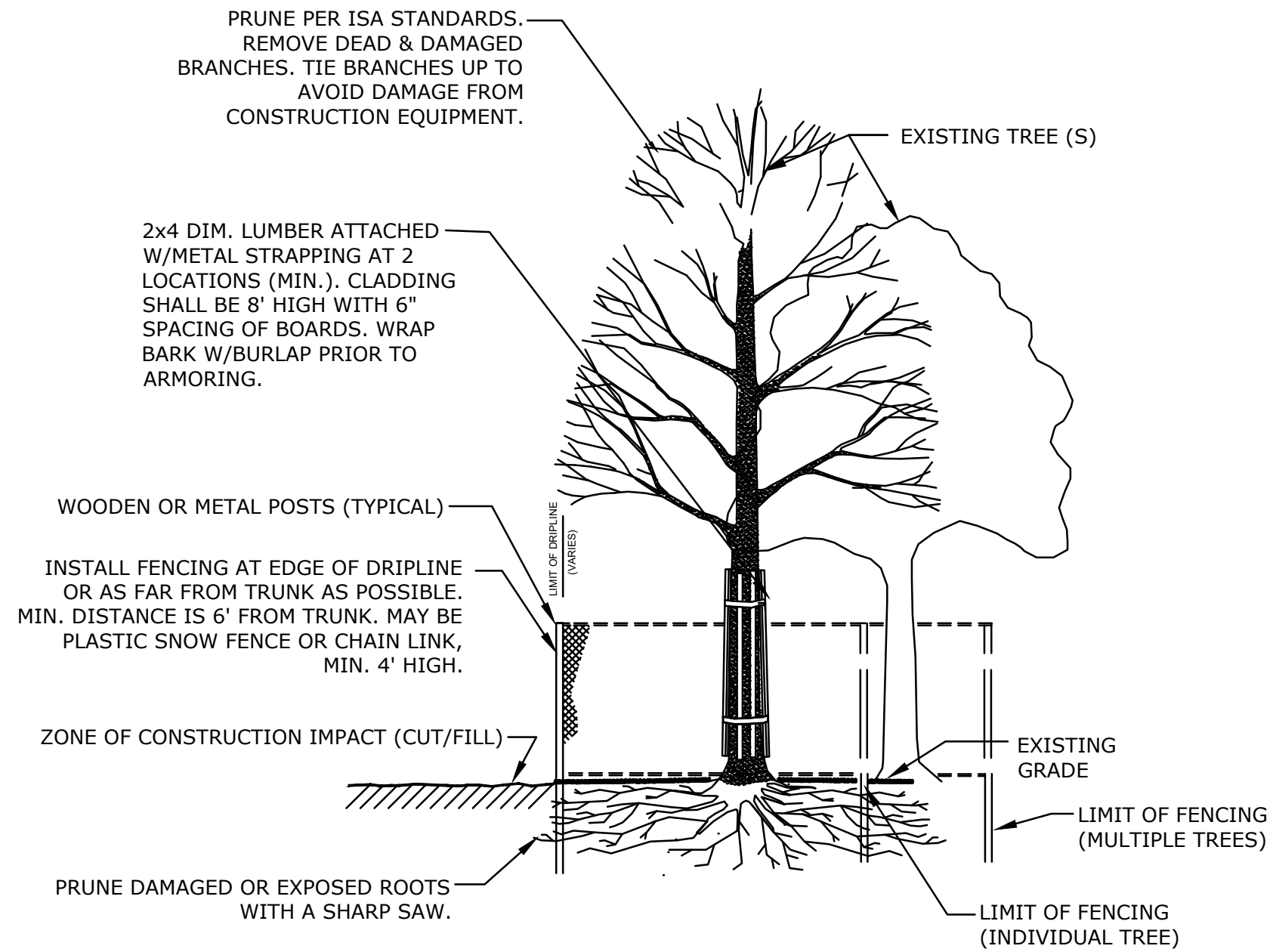
DETENTION BASIN - BERM DETAIL
NO SCALE



SHRUB PLANTING DETAIL
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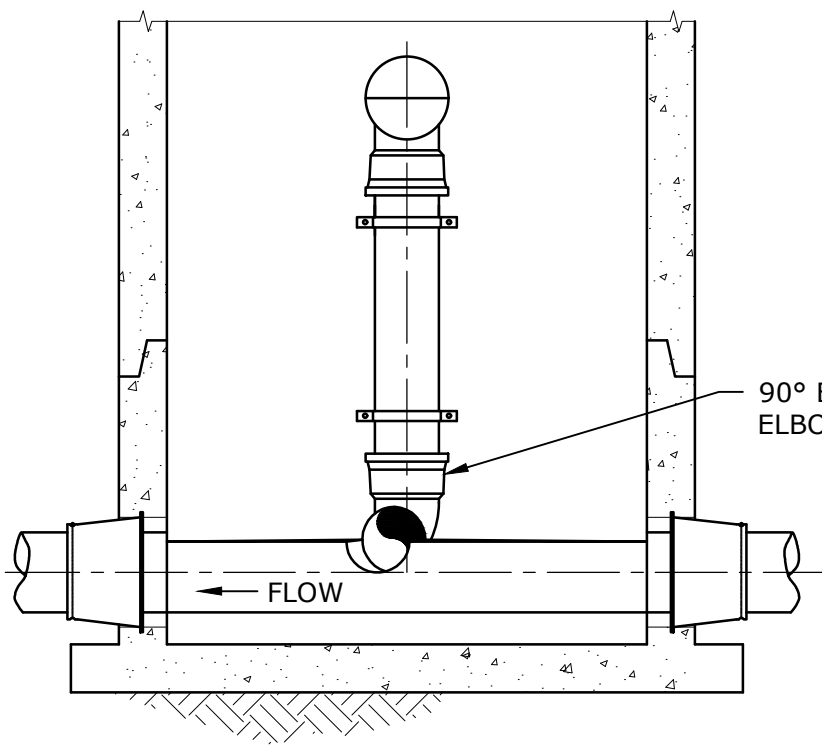
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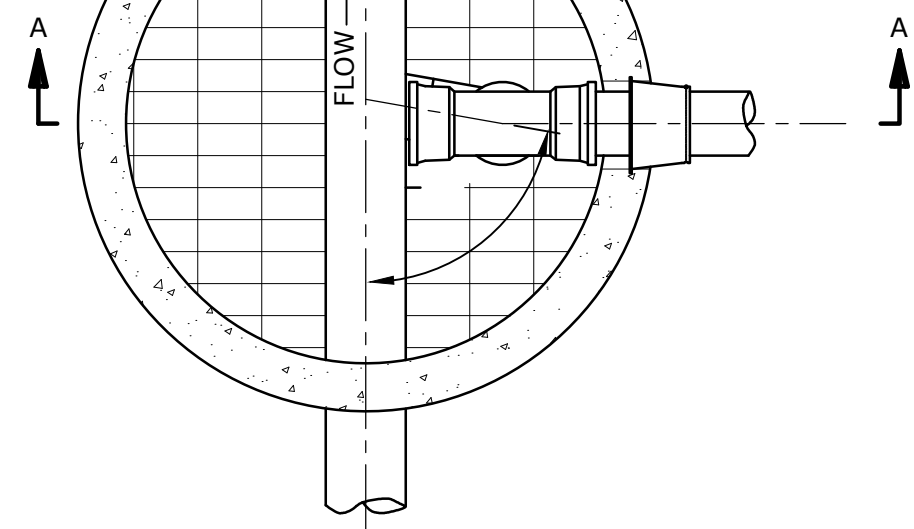
- NOTES:
- NO STORAGE OF EQUIPMENT OR STOCKPILING OF MATERIALS WITHIN DRIPLINE

TREE PROTECTION - EXISTING TREE
NO SCALE

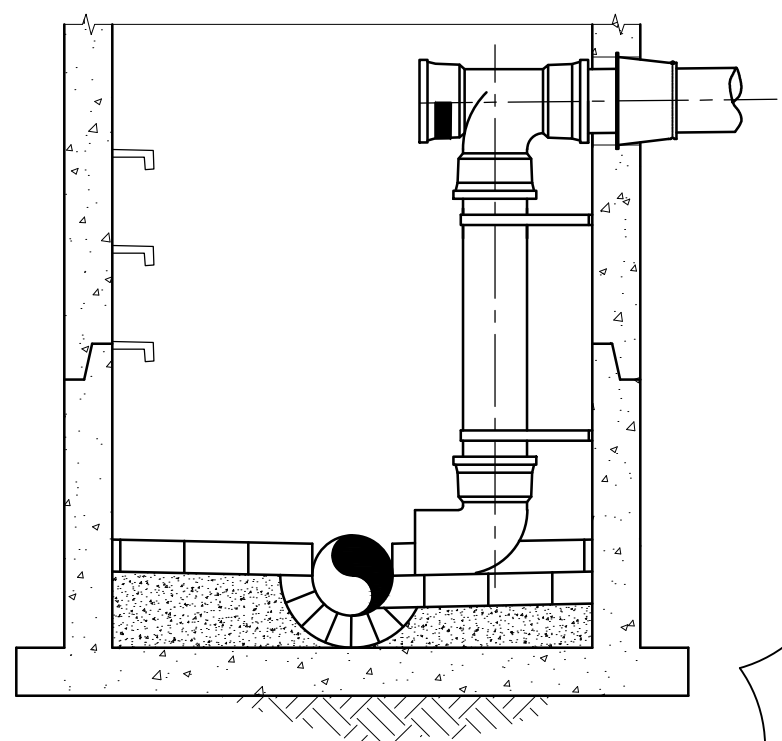
PIPE STRAP DETAIL



ELEVATION



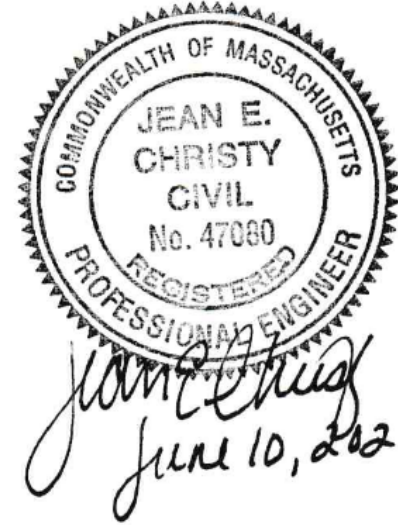
PLAN



SECTION A-A

- NOTES:
- RISER PIPE AND FITTINGS SHALL BE THE SAME DIAMETER AS THE INLET PIPE AND SHALL BE CONSTRUCTED OF SDR35 PVC PIPE
 - INTERIOR MANHOLE CHIMNEYS SHALL ONLY BE INSTALLED IN 60" DIAMETER OR LARGER MANHOLE. SEE MANHOLE DETAIL FOR FURTHER INFORMATION.
 - INTERIOR CHIMNEY TO BE USED FOR PIPES LESS THAN 12" IN DIAMETER.

INTERIOR MANHOLE CHIMNEY
NO SCALE



**PERMIT SET -
NOT FOR
CONSTRUCTION**

**Village at
Grafton
Woods**
8 Pine Street

GSX-ODG, LLC

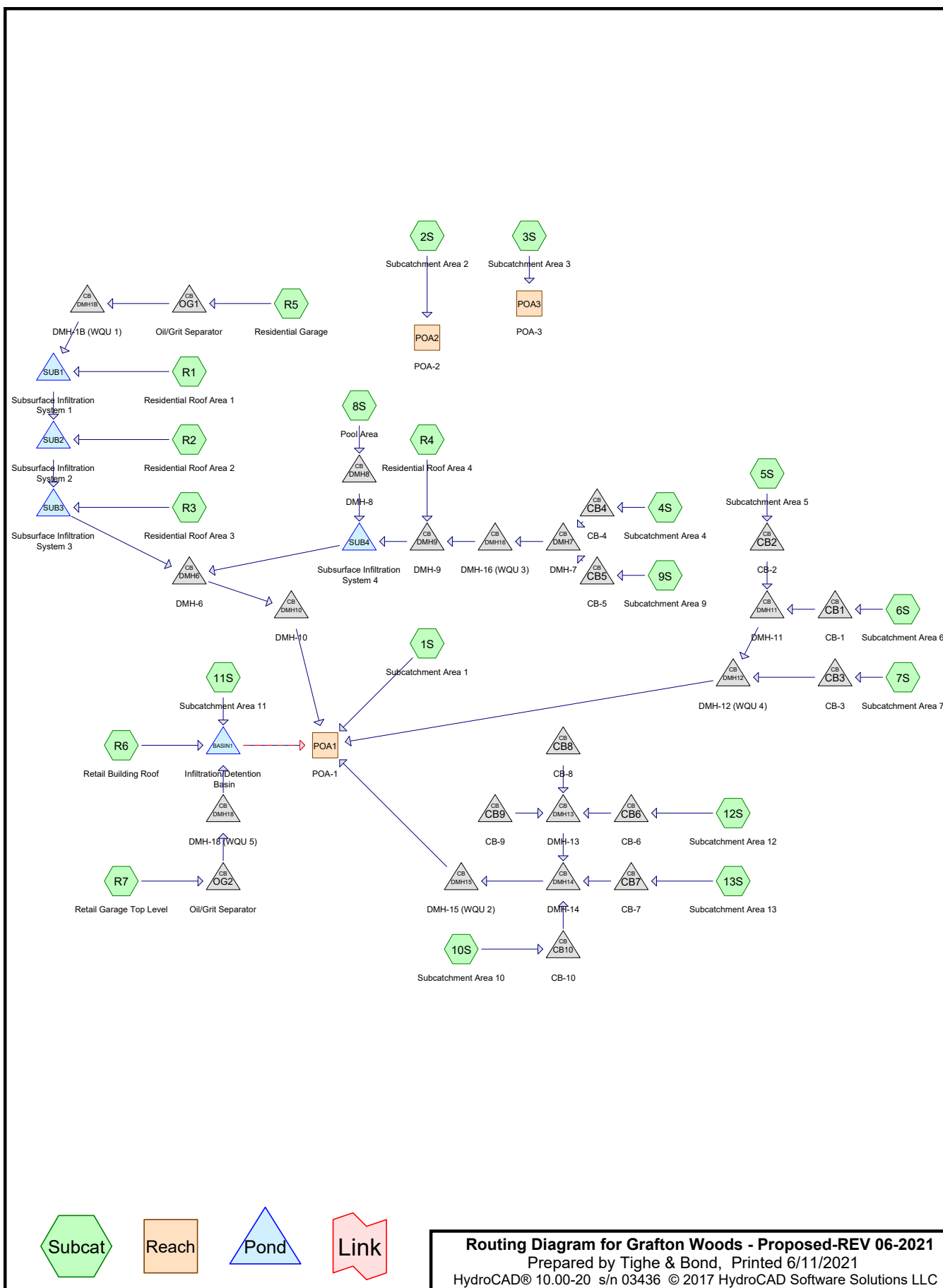
Grafton,
Massachusetts

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SITE DETAILS - 9

SCALE: NO SCALE

C-509



Grafton Woods - Proposed-REV 06-2021

Prepared by Tighe & Bond

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Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.673	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S, 4S, 5S, 6S, 7S, 10S, 11S, R7)
2.224	98	Building (R1, R2, R3, R4, R6)
2.488	98	Paved (2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 12S, 13S, R5, R7)
0.663	98	Water Surface, HSG C (1S, 11S)
0.666	70	Woods, Good, HSG C (1S, 2S)
0.167	77	Woods, Good, HSG D (3S)
8.882	88	TOTAL AREA

Grafton Woods - Proposed-REV 06-2021

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Printed 6/11/2021

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Page 3

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
4.002	HSG C	1S, 2S, 3S, 4S, 5S, 6S, 7S, 10S, 11S, R7
0.167	HSG D	3S
4.712	Other	2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 12S, 13S, R1, R2, R3, R4, R5, R6, R7
8.882		TOTAL AREA

Grafton Woods - Proposed-REV 06-2021

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Proposed Conditions REVISED 6-2021

Type III 24-hr 2-Year Rainfall=3.24"

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Page 4

Time span=0.00-20.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: SubcatchmentArea 1	Runoff Area=79,040 sf 32.88% Impervious Runoff Depth>1.39" Tc=6.0 min CN=81 Runoff=3.11 cfs 0.210 af
Subcatchment2S: SubcatchmentArea 2	Runoff Area=14,438 sf 9.25% Impervious Runoff Depth>0.97" Tc=6.0 min CN=74 Runoff=0.39 cfs 0.027 af
Subcatchment3S: SubcatchmentArea 3	Runoff Area=19,398 sf 14.17% Impervious Runoff Depth>1.26" Tc=6.0 min CN=79 Runoff=0.69 cfs 0.047 af
Subcatchment4S: SubcatchmentArea 4	Runoff Area=60,923 sf 23.51% Impervious Runoff Depth>1.32" Flow Length=717' Tc=21.7 min CN=80 Runoff=1.51 cfs 0.153 af
Subcatchment5S: SubcatchmentArea 5	Runoff Area=5,871 sf 67.16% Impervious Runoff Depth>2.07" Tc=6.0 min CN=90 Runoff=0.34 cfs 0.023 af
Subcatchment6S: SubcatchmentArea 6	Runoff Area=5,153 sf 77.86% Impervious Runoff Depth>2.35" Tc=6.0 min CN=93 Runoff=0.33 cfs 0.023 af
Subcatchment7S: SubcatchmentArea 7	Runoff Area=12,508 sf 80.51% Impervious Runoff Depth>2.35" Tc=6.0 min CN=93 Runoff=0.79 cfs 0.056 af
Subcatchment8S: Pool Area	Runoff Area=8,443 sf 100.00% Impervious Runoff Depth>2.87" Tc=6.0 min CN=98 Runoff=0.60 cfs 0.046 af
Subcatchment9S: SubcatchmentArea 9	Runoff Area=2,484 sf 100.00% Impervious Runoff Depth>2.87" Tc=6.0 min CN=98 Runoff=0.18 cfs 0.014 af
Subcatchment10S: SubcatchmentArea 10	Runoff Area=18,790 sf 23.20% Impervious Runoff Depth>1.32" Tc=6.0 min CN=80 Runoff=0.70 cfs 0.048 af
Subcatchment11S: SubcatchmentArea 11	Runoff Area=5,635 sf 51.45% Impervious Runoff Depth>1.75" Tc=6.0 min CN=86 Runoff=0.28 cfs 0.019 af
Subcatchment12S: SubcatchmentArea 12	Runoff Area=526 sf 100.00% Impervious Runoff Depth>2.87" Tc=6.0 min CN=98 Runoff=0.04 cfs 0.003 af
Subcatchment13S: SubcatchmentArea 13	Runoff Area=526 sf 100.00% Impervious Runoff Depth>2.87" Tc=6.0 min CN=98 Runoff=0.04 cfs 0.003 af
SubcatchmentR1: ResidentialRoof Area	Runoff Area=29,776 sf 100.00% Impervious Runoff Depth>2.87" Tc=6.0 min CN=98 Runoff=2.10 cfs 0.163 af
SubcatchmentR2: ResidentialRoof Area	Runoff Area=13,766 sf 100.00% Impervious Runoff Depth>2.87" Tc=6.0 min CN=98 Runoff=0.97 cfs 0.075 af
SubcatchmentR3: ResidentialRoof Area	Runoff Area=24,176 sf 100.00% Impervious Runoff Depth>2.87" Tc=6.0 min CN=98 Runoff=1.71 cfs 0.133 af

Grafton Woods - Proposed-REV 06-2021

Prepared by Tighe & Bond

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Proposed Conditions REVISED 6-2021

Type III 24-hr 2-Year Rainfall=3.24"

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SubcatchmentR4: ResidentialRoof Area Runoff Area=17,527 sf 100.00% Impervious Runoff Depth>2.87"
Tc=6.0 min CN=98 Runoff=1.24 cfs 0.096 af

SubcatchmentR5: ResidentialGarage Runoff Area=30,070 sf 100.00% Impervious Runoff Depth>2.87"
Tc=6.0 min CN=98 Runoff=2.12 cfs 0.165 af

SubcatchmentR6: Retail Building Roof Runoff Area=11,647 sf 100.00% Impervious Runoff Depth>2.87"
Tc=6.0 min CN=98 Runoff=0.82 cfs 0.064 af

SubcatchmentR7: Retail Garage Top Level Runoff Area=26,205 sf 97.45% Impervious Runoff Depth>2.76"
Tc=6.0 min CN=97 Runoff=1.82 cfs 0.138 af

Reach POA1: POA-1 Inflow=5.34 cfs 0.438 af
Outflow=5.34 cfs 0.438 af

Reach POA2: POA-2 Inflow=0.39 cfs 0.027 af
Outflow=0.39 cfs 0.027 af

Reach POA3: POA-3 Inflow=0.69 cfs 0.047 af
Outflow=0.69 cfs 0.047 af

Pond BASIN1: Infiltration/DetentionBasin Peak Elev=409.67' Storage=5,020 cf Inflow=2.92 cfs 0.221 af
Discarded=0.05 cfs 0.043 af Primary=1.19 cfs 0.072 af Secondary=0.00 cfs 0.000 af Outflow=1.24 cfs 0.115 af

Pond CB1: CB-1 Peak Elev=428.99' Inflow=0.33 cfs 0.023 af
12.0" Round Culvert n=0.013 L=4.0' S=0.0125 '/' Outflow=0.33 cfs 0.023 af

Pond CB10: CB-10 Peak Elev=409.28' Inflow=0.70 cfs 0.048 af
12.0" Round Culvert n=0.013 L=56.0' S=0.0143 '/' Outflow=0.70 cfs 0.048 af

Pond CB2: CB-2 Peak Elev=431.32' Inflow=0.34 cfs 0.023 af
12.0" Round Culvert n=0.013 L=97.0' S=0.0247 '/' Outflow=0.34 cfs 0.023 af

Pond CB3: CB-3 Peak Elev=423.52' Inflow=0.79 cfs 0.056 af
12.0" Round Culvert n=0.013 L=8.0' S=0.0275 '/' Outflow=0.79 cfs 0.056 af

Pond CB4: CB-4 Peak Elev=427.18' Inflow=1.51 cfs 0.153 af
15.0" Round Culvert n=0.013 L=4.0' S=0.0500 '/' Outflow=1.51 cfs 0.153 af

Pond CB5: CB-5 Peak Elev=426.63' Inflow=0.18 cfs 0.014 af
12.0" Round Culvert n=0.013 L=21.0' S=0.0190 '/' Outflow=0.18 cfs 0.014 af

Pond CB6: CB-6 Peak Elev=408.60' Inflow=0.04 cfs 0.003 af
12.0" Round Culvert n=0.013 L=37.0' S=0.0135 '/' Outflow=0.04 cfs 0.003 af

Pond CB7: CB-7 Peak Elev=407.40' Inflow=0.04 cfs 0.003 af
12.0" Round Culvert n=0.013 L=7.0' S=0.0429 '/' Outflow=0.04 cfs 0.003 af

Pond CB8: CB-8 Peak Elev=0.00'
12.0" Round Culvert n=0.013 L=61.0' S=0.0211 '/' Primary=0.00 cfs 0.000 af

Grafton Woods - Proposed-REV 06-2021

Prepared by Tighe & Bond

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Pond CB9: CB-9

Peak Elev=0.00'

12.0" Round Culvert n=0.013 L=54.0' S=0.0269 '/' Primary=0.00 cfs 0.000 af

Pond DMH10: DMH-10

Peak Elev=425.50' Inflow=0.00 cfs 0.000 af

30.0" Round Culvert n=0.013 L=100.0' S=0.0100 '/' Outflow=0.00 cfs 0.000 af

Pond DMH11: DMH-11

Peak Elev=426.97' Inflow=0.66 cfs 0.046 af

12.0" Round Culvert n=0.013 L=187.0' S=0.0187 '/' Outflow=0.66 cfs 0.046 af

Pond DMH12: DMH-12 (WQU 4)

Peak Elev=421.74' Inflow=1.45 cfs 0.103 af

12.0" Round Culvert n=0.013 L=13.0' S=0.1154 '/' Outflow=1.45 cfs 0.103 af

Pond DMH13: DMH-13

Peak Elev=408.00' Inflow=0.04 cfs 0.003 af

12.0" Round Culvert n=0.013 L=50.0' S=0.0080 '/' Outflow=0.04 cfs 0.003 af

Pond DMH14: DMH-14

Peak Elev=407.43' Inflow=0.78 cfs 0.053 af

12.0" Round Culvert n=0.013 L=4.0' S=0.0250 '/' Outflow=0.78 cfs 0.053 af

Pond DMH15: DMH-15 (WQU 2)

Peak Elev=407.26' Inflow=0.78 cfs 0.053 af

12.0" Round Culvert n=0.013 L=42.0' S=0.0048 '/' Outflow=0.78 cfs 0.053 af

Pond DMH16: DMH-16 (WQU 3)

Peak Elev=426.52' Inflow=1.58 cfs 0.167 af

15.0" Round Culvert n=0.013 L=3.0' S=0.0167 '/' Outflow=1.58 cfs 0.167 af

Pond DMH18: DMH-18 (WQU 5)

Peak Elev=412.86' Inflow=1.82 cfs 0.138 af

15.0" Round Culvert n=0.013 L=26.0' S=0.0231 '/' Outflow=1.82 cfs 0.138 af

Pond DMH1B: DMH-1B (WQU 1)

Peak Elev=430.78' Inflow=2.12 cfs 0.165 af

15.0" Round Culvert n=0.013 L=57.0' S=0.0053 '/' Outflow=2.12 cfs 0.165 af

Pond DMH6: DMH-6

Peak Elev=424.50' Inflow=0.00 cfs 0.000 af

30.0" Round Culvert n=0.013 L=128.0' S=0.0352 '/' Outflow=0.00 cfs 0.000 af

Pond DMH7: DMH-7

Peak Elev=426.61' Inflow=1.58 cfs 0.167 af

15.0" Round Culvert n=0.013 L=8.0' S=0.0187 '/' Outflow=1.58 cfs 0.167 af

Pond DMH8: DMH-8

Peak Elev=426.13' Inflow=0.60 cfs 0.046 af

12.0" Round Culvert n=0.013 L=5.0' S=0.0000 '/' Outflow=0.60 cfs 0.046 af

Pond DMH9: DMH-9

Peak Elev=421.49' Inflow=2.20 cfs 0.263 af

24.0" Round Culvert n=0.013 L=5.0' S=0.0100 '/' Outflow=2.20 cfs 0.263 af

Pond OG1: Oil/Grit Separator

Peak Elev=431.44' Inflow=2.12 cfs 0.165 af

15.0" Round Culvert n=0.013 L=110.0' S=0.0055 '/' Outflow=2.12 cfs 0.165 af

Pond OG2: Oil/Grit Separator

Peak Elev=413.06' Inflow=1.82 cfs 0.138 af

15.0" Round Culvert n=0.013 L=20.0' S=0.0400 '/' Outflow=1.82 cfs 0.138 af

Pond SUB1: Subsurface Infiltration System 1 Peak Elev=430.72' Storage=7,813 cf Inflow=4.22 cfs 0.328 af

Discarded=0.06 cfs 0.061 af Primary=1.37 cfs 0.102 af Outflow=1.44 cfs 0.163 af

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Pond SUB2: Subsurface Infiltration System 2 Peak Elev=428.96' Storage=6,315 cf Inflow=1.71 cfs 0.177 af
Discarded=0.04 cfs 0.036 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.036 af

Pond SUB3: Subsurface Infiltration System 3 Peak Elev=425.72' Storage=4,100 cf Inflow=1.71 cfs 0.133 af
Discarded=0.04 cfs 0.042 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.042 af

Pond SUB4: Subsurface Infiltration System Peak Elev=425.65' Storage=11,074 cf Inflow=2.78 cfs 0.309 af
Discarded=0.07 cfs 0.055 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.055 af

Total Runoff Area = 8.882 ac Runoff Volume = 1.506 af Average Runoff Depth = 2.03"
39.48% Pervious = 3.507 ac 60.52% Impervious = 5.375 ac

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Summary for Subcatchment 1S: Subcatchment Area 1

Runoff = 3.11 cfs @ 12.10 hrs, Volume= 0.210 af, Depth> 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

Area (sf)	CN	Description
31,457	74	>75% Grass cover, Good, HSG C
25,991	98	Water Surface, HSG C
21,592	70	Woods, Good, HSG C
79,040	81	Weighted Average
53,049		67.12% Pervious Area
25,991		32.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min.

Summary for Subcatchment 2S: Subcatchment Area 2

Runoff = 0.39 cfs @ 12.10 hrs, Volume= 0.027 af, Depth> 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

Area (sf)	CN	Description
5,689	74	>75% Grass cover, Good, HSG C
7,413	70	Woods, Good, HSG C
* 1,336	98	Paved
14,438	74	Weighted Average
13,102		90.75% Pervious Area
1,336		9.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc = 6 mins

Summary for Subcatchment 3S: Subcatchment Area 3

Runoff = 0.69 cfs @ 12.10 hrs, Volume= 0.047 af, Depth> 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

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	Area (sf)	CN	Description
	9,357	74	>75% Grass cover, Good, HSG C
*	2,748	98	Paved
	7,293	77	Woods, Good, HSG D
	19,398	79	Weighted Average
	16,650		85.83% Pervious Area
	2,748		14.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc = 6 mins

Summary for Subcatchment 4S: Subcatchment Area 4

Runoff = 1.51 cfs @ 12.31 hrs, Volume= 0.153 af, Depth> 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
	46,603	74	>75% Grass cover, Good, HSG C
*	14,320	98	Paved
	60,923	80	Weighted Average
	46,603		76.49% Pervious Area
	14,320		23.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.26"
13.8	580	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.5	87	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
21.7	717	Total			

Summary for Subcatchment 5S: Subcatchment Area 5

Runoff = 0.34 cfs @ 12.09 hrs, Volume= 0.023 af, Depth> 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	3,943	98	Paved
	1,928	74	>75% Grass cover, Good, HSG C
	5,871	90	Weighted Average
	1,928		32.84% Pervious Area
	3,943		67.16% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc = 6 mins

Summary for Subcatchment 6S: Subcatchment Area 6

Runoff = 0.33 cfs @ 12.09 hrs, Volume= 0.023 af, Depth> 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	4,012	98	Paved
	1,141	74	>75% Grass cover, Good, HSG C
	5,153	93	Weighted Average
	1,141		22.14% Pervious Area
	4,012		77.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc = 6 mins

Summary for Subcatchment 7S: Subcatchment Area 7

Runoff = 0.79 cfs @ 12.09 hrs, Volume= 0.056 af, Depth> 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	10,070	98	Paved
	2,438	74	>75% Grass cover, Good, HSG C
	12,508	93	Weighted Average
	2,438		19.49% Pervious Area
	10,070		80.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc = 6 mins

Summary for Subcatchment 8S: Pool Area

Runoff = 0.60 cfs @ 12.09 hrs, Volume= 0.046 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

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	Area (sf)	CN	Description
*	8,443	98	Paved
	8,443		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc = 6 mins

Summary for Subcatchment 9S: Subcatchment Area 9

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 0.014 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	2,484	98	Paved
	2,484		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc = 6

Summary for Subcatchment 10S: Subcatchment Area 10

Runoff = 0.70 cfs @ 12.10 hrs, Volume= 0.048 af, Depth> 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	4,359	98	Paved
	14,431	74	>75% Grass cover, Good, HSG C
	18,790	80	Weighted Average
	14,431		76.80% Pervious Area
	4,359		23.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc = 6 mins

Summary for Subcatchment 11S: Subcatchment Area 11

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.019 af, Depth> 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
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Area (sf)	CN	Description
2,899	98	Water Surface, HSG C
2,736	74	>75% Grass cover, Good, HSG C
5,635	86	Weighted Average
2,736		48.55% Pervious Area
2,899		51.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc = 6 mins

Summary for Subcatchment 12S: Subcatchment Area 12

Runoff = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

Area (sf)	CN	Description
* 526	98	Paved
526		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc=6mins

Summary for Subcatchment 13S: Subcatchment Area 13

Runoff = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

Area (sf)	CN	Description
* 526	98	Paved
526		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc = 6 min

Summary for Subcatchment R1: Residential Roof Area 1

Runoff = 2.10 cfs @ 12.09 hrs, Volume= 0.163 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
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	Area (sf)	CN	Description
*	29,776	98	Building
	29,776		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment R2: Residential Roof Area 2

Runoff = 0.97 cfs @ 12.09 hrs, Volume= 0.075 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	13,766	98	Building
	13,766		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment R3: Residential Roof Area 3

Runoff = 1.71 cfs @ 12.09 hrs, Volume= 0.133 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	24,176	98	Building
	24,176		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment R4: Residential Roof Area 4

Runoff = 1.24 cfs @ 12.09 hrs, Volume= 0.096 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
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	Area (sf)	CN	Description
*	17,527	98	Building
	17,527		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment R5: Residential Garage

Runoff = 2.12 cfs @ 12.09 hrs, Volume= 0.165 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	30,070	98	Paved
	30,070		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc = 6 mins

Summary for Subcatchment R6: Retail Building Roof

Runoff = 0.82 cfs @ 12.09 hrs, Volume= 0.064 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	11,647	98	Building
	11,647		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment R7: Retail Garage Top Level

Runoff = 1.82 cfs @ 12.09 hrs, Volume= 0.138 af, Depth> 2.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
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	Area (sf)	CN	Description
*	25,537	98	Paved
	668	74	>75% Grass cover, Good, HSG C
	26,205	97	Weighted Average
	668		2.55% Pervious Area
	25,537		97.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc=6mins

Summary for Reach POA1: POA-1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 8.105 ac, 65.16% Impervious, Inflow Depth > 0.65" for 2-Year event
 Inflow = 5.34 cfs @ 12.09 hrs, Volume= 0.438 af
 Outflow = 5.34 cfs @ 12.09 hrs, Volume= 0.438 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach POA2: POA-2

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.331 ac, 9.25% Impervious, Inflow Depth > 0.97" for 2-Year event
 Inflow = 0.39 cfs @ 12.10 hrs, Volume= 0.027 af
 Outflow = 0.39 cfs @ 12.10 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach POA3: POA-3

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.445 ac, 14.17% Impervious, Inflow Depth > 1.26" for 2-Year event
 Inflow = 0.69 cfs @ 12.10 hrs, Volume= 0.047 af
 Outflow = 0.69 cfs @ 12.10 hrs, Volume= 0.047 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond BASIN1: Infiltration/Detention Basin

Inflow Area = 0.998 ac, 92.17% Impervious, Inflow Depth > 2.65" for 2-Year event
 Inflow = 2.92 cfs @ 12.09 hrs, Volume= 0.221 af
 Outflow = 1.24 cfs @ 12.30 hrs, Volume= 0.115 af, Atten= 57%, Lag= 12.6 min
 Discarded = 0.05 cfs @ 12.30 hrs, Volume= 0.043 af
 Primary = 1.19 cfs @ 12.30 hrs, Volume= 0.072 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

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Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 409.67' @ 12.30 hrs Surf.Area= 2,274 sf Storage= 5,020 cf

Plug-Flow detention time= 180.4 min calculated for 0.115 af (52% of inflow)
 Center-of-Mass det. time= 86.8 min (826.0 - 739.2)

Volume	Invert	Avail.Storage	Storage Description		
#1	406.00'	11,086 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
406.00	623	102.8	0	0	623
407.00	975	127.7	792	792	1,094
408.00	1,401	152.3	1,182	1,974	1,660
409.00	1,898	176.2	1,643	3,617	2,306
410.00	2,468	199.9	2,177	5,794	3,040
411.00	3,103	220.7	2,779	8,573	3,767
411.75	3,602	233.9	2,512	11,086	4,274

Device	Routing	Invert	Outlet Devices
#1	Discarded	406.00'	0.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 405.50'
#2	Secondary	410.75'	15.0' long x 8.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#3	Primary	405.00'	15.0" Round Culvert L= 60.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 405.00' / 401.00' S= 0.0667 ' S= 0.0667 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#4	Device 3	409.50'	15.0" x 15.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 12.30 hrs HW=409.67' (Free Discharge)
 ↑ **1=Exfiltration** (Controls 0.05 cfs)

Primary OutFlow Max=1.18 cfs @ 12.30 hrs HW=409.67' (Free Discharge)
 ↑ **3=Culvert** (Passes 1.18 cfs of 10.49 cfs potential flow)
 ↑ **4=Orifice/Grate** (Weir Controls 1.18 cfs @ 1.36 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=406.00' (Free Discharge)
 ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

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Summary for Pond CB1: CB-1

Inflow Area = 0.118 ac, 77.86% Impervious, Inflow Depth > 2.35" for 2-Year event
 Inflow = 0.33 cfs @ 12.09 hrs, Volume= 0.023 af
 Outflow = 0.33 cfs @ 12.09 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.33 cfs @ 12.09 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 428.99' @ 12.09 hrs

Flood Elev= 431.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	428.65'	12.0" Round Culvert L= 4.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 428.65' / 428.60' S= 0.0125'/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.32 cfs @ 12.09 hrs HW=428.99' (Free Discharge)↑**1=Culvert** (Barrel Controls 0.32 cfs @ 2.01 fps)**Summary for Pond CB10: CB-10**

Inflow Area = 0.431 ac, 23.20% Impervious, Inflow Depth > 1.32" for 2-Year event
 Inflow = 0.70 cfs @ 12.10 hrs, Volume= 0.048 af
 Outflow = 0.70 cfs @ 12.10 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.70 cfs @ 12.10 hrs, Volume= 0.048 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 409.28' @ 12.10 hrs

Flood Elev= 411.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	408.80'	12.0" Round Culvert L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 408.80' / 408.00' S= 0.0143'/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.70 cfs @ 12.10 hrs HW=409.28' (Free Discharge)↑**1=Culvert** (Inlet Controls 0.70 cfs @ 1.86 fps)**Summary for Pond CB2: CB-2**

Inflow Area = 0.135 ac, 67.16% Impervious, Inflow Depth > 2.07" for 2-Year event
 Inflow = 0.34 cfs @ 12.09 hrs, Volume= 0.023 af
 Outflow = 0.34 cfs @ 12.09 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.34 cfs @ 12.09 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

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Peak Elev= 431.32' @ 12.09 hrs

Flood Elev= 434.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	431.00'	12.0" Round Culvert L= 97.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 431.00' / 428.60' S= 0.0247 ' S= 0.0247 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.33 cfs @ 12.09 hrs HW=431.32' (Free Discharge)

↑**1=Culvert** (Inlet Controls 0.33 cfs @ 1.52 fps)

Summary for Pond CB3: CB-3

Inflow Area = 0.287 ac, 80.51% Impervious, Inflow Depth > 2.35" for 2-Year event
Inflow = 0.79 cfs @ 12.09 hrs, Volume= 0.056 af
Outflow = 0.79 cfs @ 12.09 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min
Primary = 0.79 cfs @ 12.09 hrs, Volume= 0.056 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 423.52' @ 12.09 hrs

Flood Elev= 426.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	423.00'	12.0" Round Culvert L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 423.00' / 422.78' S= 0.0275 ' S= 0.0275 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.77 cfs @ 12.09 hrs HW=423.51' (Free Discharge)

↑**1=Culvert** (Inlet Controls 0.77 cfs @ 1.92 fps)

Summary for Pond CB4: CB-4

Inflow Area = 1.399 ac, 23.51% Impervious, Inflow Depth > 1.32" for 2-Year event
Inflow = 1.51 cfs @ 12.31 hrs, Volume= 0.153 af
Outflow = 1.51 cfs @ 12.31 hrs, Volume= 0.153 af, Atten= 0%, Lag= 0.0 min
Primary = 1.51 cfs @ 12.31 hrs, Volume= 0.153 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 427.18' @ 12.31 hrs

Flood Elev= 429.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	426.50'	15.0" Round Culvert L= 4.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 426.50' / 426.30' S= 0.0500 ' S= 0.0500 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

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Primary OutFlow Max=1.50 cfs @ 12.31 hrs HW=427.18' (Free Discharge)

↑1=Culvert (Inlet Controls 1.50 cfs @ 2.21 fps)

Summary for Pond CB5: CB-5

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 2.87" for 2-Year event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 0.014 af
Outflow = 0.18 cfs @ 12.09 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min
Primary = 0.18 cfs @ 12.09 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 426.63' @ 12.09 hrs

Flood Elev= 429.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	426.40'	12.0" Round Culvert L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 426.40' / 426.00' S= 0.0190' /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.17 cfs @ 12.09 hrs HW=426.63' (Free Discharge)

↑1=Culvert (Inlet Controls 0.17 cfs @ 1.28 fps)

Summary for Pond CB6: CB-6

Redundant CB - Covered by upper parking deck, minimal flow from parking area outside of covered area

Inflow Area = 0.012 ac, 100.00% Impervious, Inflow Depth > 2.87" for 2-Year event
Inflow = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af
Outflow = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 408.60' @ 12.09 hrs

Flood Elev= 411.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	408.50'	12.0" Round Culvert L= 37.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 408.50' / 408.00' S= 0.0135' /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.04 cfs @ 12.09 hrs HW=408.60' (Free Discharge)

↑1=Culvert (Inlet Controls 0.04 cfs @ 0.85 fps)

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Summary for Pond CB7: CB-7

Redundant CB - Covered by upper parking deck, minimal flow from parking area outside of covered area

Inflow Area = 0.012 ac, 100.00% Impervious, Inflow Depth > 2.87" for 2-Year event
Inflow = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af
Outflow = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 407.40' @ 12.09 hrs

Flood Elev= 411.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	407.30'	12.0" Round Culvert L= 7.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 407.30' / 407.00' S= 0.0429 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.03 cfs @ 12.09 hrs HW=407.40' (Free Discharge)

↑1=Culvert (Inlet Controls 0.03 cfs @ 0.85 fps)

Summary for Pond CB8: CB-8

Redundant CB - Covered by upper parking deck, no flow anticipated

[43] Hint: Has no inflow (Outflow=Zero)

Device	Routing	Invert	Outlet Devices
#1	Primary	409.29'	12.0" Round Culvert L= 61.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 409.29' / 408.00' S= 0.0211 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)

↑1=Culvert (Controls 0.00 cfs)

Summary for Pond CB9: CB-9

Redundant CB - Covered by upper parking deck, no flow anticipated

[43] Hint: Has no inflow (Outflow=Zero)

Device	Routing	Invert	Outlet Devices
#1	Primary	409.45'	12.0" Round Culvert L= 54.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 409.45' / 408.00' S= 0.0269 '/' Cc= 0.900

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n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)

↑1=Culvert (Controls 0.00 cfs)

Summary for Pond DMH10: DMH-10

[81] Warning: Exceeded Pond DMH6 by 1.00' @ 0.00 hrs

Inflow Area = 4.297 ac, 75.10% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 425.50' @ 0.00 hrs

Flood Elev= 427.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	425.50'	30.0" Round Culvert L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 425.50' / 424.50' S= 0.0100'/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=425.50' (Free Discharge)

↑1=Culvert (Controls 0.00 cfs)

Summary for Pond DMH11: DMH-11

Inflow Area = 0.253 ac, 72.16% Impervious, Inflow Depth > 2.20" for 2-Year event
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 0.046 af
Outflow = 0.66 cfs @ 12.09 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min
Primary = 0.66 cfs @ 12.09 hrs, Volume= 0.046 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 426.97' @ 12.09 hrs

Flood Elev= 431.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	426.50'	12.0" Round Culvert L= 187.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 426.50' / 423.00' S= 0.0187'/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.65 cfs @ 12.09 hrs HW=426.96' (Free Discharge)

↑1=Culvert (Inlet Controls 0.65 cfs @ 1.83 fps)

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Summary for Pond DMH12: DMH-12 (WQU 4)

Inflow Area = 0.540 ac, 76.60% Impervious, Inflow Depth > 2.28" for 2-Year event
Inflow = 1.45 cfs @ 12.09 hrs, Volume= 0.103 af
Outflow = 1.45 cfs @ 12.09 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min
Primary = 1.45 cfs @ 12.09 hrs, Volume= 0.103 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 421.74' @ 12.09 hrs

Flood Elev= 426.84'

Device	Routing	Invert	Outlet Devices
#1	Primary	421.00'	12.0" Round Culvert L= 13.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 421.00' / 419.50' S= 0.1154 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.42 cfs @ 12.09 hrs HW=421.73' (Free Discharge)

↑**1=Culvert** (Inlet Controls 1.42 cfs @ 2.30 fps)

Summary for Pond DMH13: DMH-13

Inflow Area = 0.012 ac, 100.00% Impervious, Inflow Depth > 2.87" for 2-Year event
Inflow = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af
Outflow = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 408.00' @ 12.09 hrs

Flood Elev= 413.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	407.90'	12.0" Round Culvert L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 407.90' / 407.50' S= 0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.04 cfs @ 12.09 hrs HW=408.00' (Free Discharge)

↑**1=Culvert** (Inlet Controls 0.04 cfs @ 0.86 fps)

Summary for Pond DMH14: DMH-14

[81] Warning: Exceeded Pond CB7 by 0.03' @ 12.10 hrs

Inflow Area = 0.456 ac, 27.27% Impervious, Inflow Depth > 1.41" for 2-Year event
Inflow = 0.78 cfs @ 12.09 hrs, Volume= 0.053 af
Outflow = 0.78 cfs @ 12.09 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min
Primary = 0.78 cfs @ 12.09 hrs, Volume= 0.053 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

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Peak Elev= 407.43' @ 12.09 hrs

Flood Elev= 411.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	406.90'	12.0" Round Culvert L= 4.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 406.90' / 406.80' S= 0.0250 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.77 cfs @ 12.09 hrs HW=407.42' (Free Discharge)↑**1=Culvert** (Barrel Controls 0.77 cfs @ 2.69 fps)**Summary for Pond DMH15: DMH-15 (WQU 2)**

[79] Warning: Submerged Pond DMH14 Primary device # 1 INLET by 0.35'

Inflow Area = 0.456 ac, 27.27% Impervious, Inflow Depth > 1.41" for 2-Year event
Inflow = 0.78 cfs @ 12.09 hrs, Volume= 0.053 af
Outflow = 0.78 cfs @ 12.09 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min
Primary = 0.78 cfs @ 12.09 hrs, Volume= 0.053 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 407.26' @ 12.09 hrs

Flood Elev= 411.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	406.70'	12.0" Round Culvert L= 42.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 406.70' / 406.50' S= 0.0048 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.77 cfs @ 12.09 hrs HW=407.25' (Free Discharge)↑**1=Culvert** (Barrel Controls 0.77 cfs @ 2.50 fps)**Summary for Pond DMH16: DMH-16 (WQU 3)**

[79] Warning: Submerged Pond DMH7 Primary device # 1 INLET by 0.62'

Inflow Area = 1.456 ac, 26.50% Impervious, Inflow Depth > 1.38" for 2-Year event
Inflow = 1.58 cfs @ 12.31 hrs, Volume= 0.167 af
Outflow = 1.58 cfs @ 12.31 hrs, Volume= 0.167 af, Atten= 0%, Lag= 0.0 min
Primary = 1.58 cfs @ 12.31 hrs, Volume= 0.167 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 426.52' @ 12.31 hrs

Flood Elev= 430.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	425.75'	15.0" Round Culvert L= 3.0' CPP, projecting, no headwall, Ke= 0.900

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Inlet / Outlet Invert= 425.75' / 425.70' S= 0.0167 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.57 cfs @ 12.31 hrs HW=426.52' (Free Discharge)

↑**1=Culvert** (Barrel Controls 1.57 cfs @ 2.82 fps)

Summary for Pond DMH18: DMH-18 (WQU 5)

[79] Warning: Submerged Pond OG2 Primary device # 1 INLET by 0.55'

Inflow Area = 0.602 ac, 97.45% Impervious, Inflow Depth > 2.76" for 2-Year event
Inflow = 1.82 cfs @ 12.09 hrs, Volume= 0.138 af
Outflow = 1.82 cfs @ 12.09 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min
Primary = 1.82 cfs @ 12.09 hrs, Volume= 0.138 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 412.86' @ 12.09 hrs

Flood Elev= 413.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	412.10'	15.0" Round Culvert L= 26.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 412.10' / 411.50' S= 0.0231 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.77 cfs @ 12.09 hrs HW=412.85' (Free Discharge)

↑**1=Culvert** (Inlet Controls 1.77 cfs @ 2.32 fps)

Summary for Pond DMH1B: DMH-1B (WQU 1)

[79] Warning: Submerged Pond OG1 Primary device # 1 INLET by 0.17'

Inflow Area = 0.690 ac, 100.00% Impervious, Inflow Depth > 2.87" for 2-Year event
Inflow = 2.12 cfs @ 12.09 hrs, Volume= 0.165 af
Outflow = 2.12 cfs @ 12.09 hrs, Volume= 0.165 af, Atten= 0%, Lag= 0.0 min
Primary = 2.12 cfs @ 12.09 hrs, Volume= 0.165 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 430.78' @ 12.09 hrs

Flood Elev= 434.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	429.90'	15.0" Round Culvert L= 57.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 429.90' / 429.60' S= 0.0053 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.06 cfs @ 12.09 hrs HW=430.76' (Free Discharge)

↑**1=Culvert** (Barrel Controls 2.06 cfs @ 3.22 fps)

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Summary for Pond DMH6: DMH-6

[79] Warning: Submerged Pond SUB4 Primary device # 3 INLET by 0.50'

Inflow Area = 4.297 ac, 75.10% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 424.50' @ 0.00 hrs

Flood Elev= 427.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	424.50'	30.0" Round Culvert L= 128.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 424.50' / 420.00' S= 0.0352 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=424.50' (Free Discharge)

↑1=Culvert (Controls 0.00 cfs)

Summary for Pond DMH7: DMH-7

[79] Warning: Submerged Pond CB4 Primary device # 1 INLET by 0.11'

[81] Warning: Exceeded Pond CB5 by 0.07' @ 12.35 hrs

Inflow Area = 1.456 ac, 26.50% Impervious, Inflow Depth > 1.38" for 2-Year event
Inflow = 1.58 cfs @ 12.31 hrs, Volume= 0.167 af
Outflow = 1.58 cfs @ 12.31 hrs, Volume= 0.167 af, Atten= 0%, Lag= 0.0 min
Primary = 1.58 cfs @ 12.31 hrs, Volume= 0.167 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 426.61' @ 12.31 hrs

Flood Elev= 429.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	425.90'	15.0" Round Culvert L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 425.90' / 425.75' S= 0.0187 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.57 cfs @ 12.31 hrs HW=426.61' (Free Discharge)

↑1=Culvert (Barrel Controls 1.57 cfs @ 3.16 fps)

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Summary for Pond DMH8: DMH-8

Inflow Area = 0.194 ac, 100.00% Impervious, Inflow Depth > 2.87" for 2-Year event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 0.046 af
Outflow = 0.60 cfs @ 12.09 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min
Primary = 0.60 cfs @ 12.09 hrs, Volume= 0.046 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 426.13' @ 12.09 hrs

Flood Elev= 431.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	425.60'	12.0" Round Culvert L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 425.60' / 425.60' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.58 cfs @ 12.09 hrs HW=426.13' (Free Discharge)

↑1=Culvert (Barrel Controls 0.58 cfs @ 2.01 fps)

Summary for Pond DMH9: DMH-9

Inflow Area = 1.858 ac, 42.42% Impervious, Inflow Depth > 1.70" for 2-Year event
Inflow = 2.20 cfs @ 12.12 hrs, Volume= 0.263 af
Outflow = 2.20 cfs @ 12.12 hrs, Volume= 0.263 af, Atten= 0%, Lag= 0.0 min
Primary = 2.20 cfs @ 12.12 hrs, Volume= 0.263 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 421.49' @ 12.12 hrs

Flood Elev= 430.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	420.70'	24.0" Round Culvert L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 420.70' / 420.65' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=2.16 cfs @ 12.12 hrs HW=421.48' (Free Discharge)

↑1=Culvert (Barrel Controls 2.16 cfs @ 2.81 fps)

Summary for Pond OG1: Oil/Grit Separator

Inflow Area = 0.690 ac, 100.00% Impervious, Inflow Depth > 2.87" for 2-Year event
Inflow = 2.12 cfs @ 12.09 hrs, Volume= 0.165 af
Outflow = 2.12 cfs @ 12.09 hrs, Volume= 0.165 af, Atten= 0%, Lag= 0.0 min
Primary = 2.12 cfs @ 12.09 hrs, Volume= 0.165 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

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Peak Elev= 431.44' @ 12.09 hrs

Flood Elev= 436.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	430.60'	15.0" Round Culvert L= 110.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 430.60' / 430.00' S= 0.0055 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.06 cfs @ 12.09 hrs HW=431.43' (Free Discharge)

↑**1=Culvert** (Barrel Controls 2.06 cfs @ 3.40 fps)

Summary for Pond OG2: Oil/Grit Separator

[57] Hint: Peaked at 413.06' (Flood elevation advised)

Inflow Area = 0.602 ac, 97.45% Impervious, Inflow Depth > 2.76" for 2-Year event
Inflow = 1.82 cfs @ 12.09 hrs, Volume= 0.138 af
Outflow = 1.82 cfs @ 12.09 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min
Primary = 1.82 cfs @ 12.09 hrs, Volume= 0.138 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 413.06' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	412.30'	15.0" Round Culvert L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 412.30' / 411.50' S= 0.0400 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.77 cfs @ 12.09 hrs HW=413.05' (Free Discharge)

↑**1=Culvert** (Inlet Controls 1.77 cfs @ 2.32 fps)

Summary for Pond SUB1: Subsurface Infiltration System 1

[81] Warning: Exceeded Pond DMH1B by 0.51' @ 19.95 hrs

Inflow Area = 1.374 ac, 100.00% Impervious, Inflow Depth > 2.87" for 2-Year event
Inflow = 4.22 cfs @ 12.09 hrs, Volume= 0.328 af
Outflow = 1.44 cfs @ 12.37 hrs, Volume= 0.163 af, Atten= 66%, Lag= 17.0 min
Discarded = 0.06 cfs @ 12.37 hrs, Volume= 0.061 af
Primary = 1.37 cfs @ 12.37 hrs, Volume= 0.102 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 430.72' @ 12.37 hrs Surf.Area= 3,538 sf Storage= 7,813 cf

Flood Elev= 435.80' Surf.Area= 3,538 sf Storage= 15,250 cf

Plug-Flow detention time= 181.9 min calculated for 0.163 af (50% of inflow)

Center-of-Mass det. time= 78.9 min (807.5 - 728.5)

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Volume	Invert	Avail.Storage	Storage Description
#1A	427.65'	5,804 cf	55.75'W x 63.47'L x 6.75'H Field A 23,883 cf Overall - 9,374 cf Embedded = 14,510 cf x 40.0% Voids
#2A	428.40'	9,374 cf	ADS_StormTech MC-4500 +Cap x 84 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 6 Rows of 14 Chambers Cap Storage= +35.7 cf x 2 x 6 rows = 428.4 cf
#3	430.00'	73 cf	4.00'D x 5.80'H DMH-1A -Impervious
		15,250 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	427.65'	0.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 426.00'
#2	Primary	430.00'	24.0" Round Culvert L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 430.00' / 429.70' S= 0.0060 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	430.50'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.06 cfs @ 12.37 hrs HW=430.72' (Free Discharge)↑ **1=Exfiltration** (Controls 0.06 cfs)**Primary OutFlow** Max=1.35 cfs @ 12.37 hrs HW=430.72' (Free Discharge)↑ **2=Culvert** (Passes 1.35 cfs of 2.18 cfs potential flow)↑ **3=Sharp-Crested Rectangular Weir**(Weir Controls 1.35 cfs @ 1.54 fps)**Summary for Pond SUB2: Subsurface Infiltration System 2**

Inflow Area = 1.690 ac, 100.00% Impervious, Inflow Depth > 1.26" for 2-Year event
Inflow = 1.71 cfs @ 12.35 hrs, Volume= 0.177 af
Outflow = 0.04 cfs @ 17.71 hrs, Volume= 0.036 af, Atten= 97%, Lag= 321.4 min
Discarded = 0.04 cfs @ 17.71 hrs, Volume= 0.036 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 428.96' @ 17.71 hrs Surf.Area= 2,586 sf Storage= 6,315 cf
Flood Elev= 433.80' Surf.Area= 2,586 sf Storage= 11,082 cf

Plug-Flow detention time= 233.9 min calculated for 0.036 af (20% of inflow)

Center-of-Mass det. time= 78.7 min (855.5 - 776.8)

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Volume	Invert	Avail.Storage	Storage Description
#1A	425.55'	4,284 cf	46.67'W x 55.42'L x 6.75'H Field A 17,456 cf Overall - 6,746 cf Embedded = 10,710 cf x 40.0% Voids
#2A	426.30'	6,746 cf	ADS_StormTech MC-4500 +Cap x 60 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 5 Rows of 12 Chambers Cap Storage= +35.7 cf x 2 x 5 rows = 357.0 cf
#3	429.70'	52 cf	4.00'D x 4.10'H DMH-3-Impervious
		11,082 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	425.55'	0.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 423.50'
#2	Primary	429.70'	24.0" Round Culvert L= 125.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 429.70' / 427.80' S= 0.0152 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	430.70'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.04 cfs @ 17.71 hrs HW=428.96' (Free Discharge)↑ **1=Exfiltration** (Controls 0.04 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=425.55' (Free Discharge)↑ **2=Culvert** (Controls 0.00 cfs)↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)**Summary for Pond SUB3: Subsurface Infiltration System 3**

Inflow Area = 2.245 ac, 100.00% Impervious, Inflow Depth > 0.71" for 2-Year event
Inflow = 1.71 cfs @ 12.09 hrs, Volume= 0.133 af
Outflow = 0.04 cfs @ 16.67 hrs, Volume= 0.042 af, Atten= 98%, Lag= 275.3 min
Discarded = 0.04 cfs @ 16.67 hrs, Volume= 0.042 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 425.72' @ 16.67 hrs Surf.Area= 3,538 sf Storage= 4,100 cf
Flood Elev= 431.40' Surf.Area= 3,538 sf Storage= 15,220 cf

Plug-Flow detention time= 233.7 min calculated for 0.042 af (31% of inflow)
Center-of-Mass det. time= 76.4 min (804.9 - 728.5)

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Volume	Invert	Avail.Storage	Storage Description
#1A	423.95'	5,804 cf	55.75'W x 63.47'L x 6.75'H Field A 23,883 cf Overall - 9,374 cf Embedded = 14,510 cf x 40.0% Voids
#2A	424.70'	9,374 cf	ADS_StormTech MC-4500 +Cap x 84 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 6 Rows of 14 Chambers Cap Storage= +35.7 cf x 2 x 6 rows = 428.4 cf
#3	428.00'	43 cf	4.00'D x 3.40'H DMH-5-Impervious
		15,220 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	423.95'	0.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 421.95'
#2	Primary	427.00'	24.0" Round Culvert L= 61.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 427.00' / 426.00' S= 0.0164 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	429.70'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.04 cfs @ 16.67 hrs HW=425.72' (Free Discharge)↑ **1=Exfiltration** (Controls 0.04 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=423.95' (Free Discharge)↑ **2=Culvert** (Controls 0.00 cfs)↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)**Summary for Pond SUB4: Subsurface Infiltration System 4**

[79] Warning: Submerged Pond DMH8 Primary device # 1 by 0.05'

[81] Warning: Exceeded Pond DMH9 by 4.83' @ 19.95 hrs

Inflow Area = 2.052 ac, 47.86% Impervious, Inflow Depth > 1.81" for 2-Year event
 Inflow = 2.78 cfs @ 12.11 hrs, Volume= 0.309 af
 Outflow = 0.07 cfs @ 20.00 hrs, Volume= 0.055 af, Atten= 97%, Lag= 473.6 min
 Discarded = 0.07 cfs @ 20.00 hrs, Volume= 0.055 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 425.65' @ 20.00 hrs Surf.Area= 2,906 sf Storage= 11,074 cf
 Flood Elev= 432.40' Surf.Area= 2,906 sf Storage= 12,384 cf

Plug-Flow detention time= 282.9 min calculated for 0.055 af (18% of inflow)

Center-of-Mass det. time= 92.7 min (864.2 - 771.6)

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Volume	Invert	Avail.Storage	Storage Description
#1A	419.95'	4,892 cf	73.92'W x 39.32'L x 6.75'H Field A 19,617 cf Overall - 7,387 cf Embedded = 12,230 cf x 40.0% Voids
#2A	420.70'	7,387 cf	ADS_StormTech MC-4500 +Cap x 64 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 8 Rows of 8 Chambers Cap Storage= +35.7 cf x 2 x 8 rows = 571.2 cf
#3	424.00'	106 cf	4.00'D x 8.40'H DMH-17-Impervious
		12,384 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	419.95'	0.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 417.95'
#2	Device 3	425.70'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Primary	424.00'	24.0" Round Culvert L= 83.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 424.00' / 423.00' S= 0.0120 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Discarded OutFlow Max=0.07 cfs @ 20.00 hrs HW=425.65' (Free Discharge)↑ **1=Exfiltration** (Controls 0.07 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=419.95' (Free Discharge)↑ **3=Culvert** (Controls 0.00 cfs)↑ **2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Time span=0.00-20.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: SubcatchmentArea 1	Runoff Area=79,040 sf 32.88% Impervious Runoff Depth>2.68" Tc=6.0 min CN=81 Runoff=5.98 cfs 0.406 af
Subcatchment2S: SubcatchmentArea 2	Runoff Area=14,438 sf 9.25% Impervious Runoff Depth>2.09" Tc=6.0 min CN=74 Runoff=0.86 cfs 0.058 af
Subcatchment3S: SubcatchmentArea 3	Runoff Area=19,398 sf 14.17% Impervious Runoff Depth>2.51" Tc=6.0 min CN=79 Runoff=1.38 cfs 0.093 af
Subcatchment4S: SubcatchmentArea 4	Runoff Area=60,923 sf 23.51% Impervious Runoff Depth>2.58" Flow Length=717' Tc=21.7 min CN=80 Runoff=2.96 cfs 0.301 af
Subcatchment5S: SubcatchmentArea 5	Runoff Area=5,871 sf 67.16% Impervious Runoff Depth>3.55" Tc=6.0 min CN=90 Runoff=0.56 cfs 0.040 af
Subcatchment6S: SubcatchmentArea 6	Runoff Area=5,153 sf 77.86% Impervious Runoff Depth>3.86" Tc=6.0 min CN=93 Runoff=0.52 cfs 0.038 af
Subcatchment7S: SubcatchmentArea 7	Runoff Area=12,508 sf 80.51% Impervious Runoff Depth>3.86" Tc=6.0 min CN=93 Runoff=1.26 cfs 0.092 af
Subcatchment8S: Pool Area	Runoff Area=8,443 sf 100.00% Impervious Runoff Depth>4.42" Tc=6.0 min CN=98 Runoff=0.90 cfs 0.071 af
Subcatchment9S: SubcatchmentArea 9	Runoff Area=2,484 sf 100.00% Impervious Runoff Depth>4.42" Tc=6.0 min CN=98 Runoff=0.27 cfs 0.021 af
Subcatchment10S: SubcatchmentArea 10	Runoff Area=18,790 sf 23.20% Impervious Runoff Depth>2.60" Tc=6.0 min CN=80 Runoff=1.38 cfs 0.093 af
Subcatchment11S: SubcatchmentArea 11	Runoff Area=5,635 sf 51.45% Impervious Runoff Depth>3.15" Tc=6.0 min CN=86 Runoff=0.49 cfs 0.034 af
Subcatchment12S: SubcatchmentArea 12	Runoff Area=526 sf 100.00% Impervious Runoff Depth>4.42" Tc=6.0 min CN=98 Runoff=0.06 cfs 0.004 af
Subcatchment13S: SubcatchmentArea 13	Runoff Area=526 sf 100.00% Impervious Runoff Depth>4.42" Tc=6.0 min CN=98 Runoff=0.06 cfs 0.004 af
SubcatchmentR1: ResidentialRoof Area	Runoff Area=29,776 sf 100.00% Impervious Runoff Depth>4.42" Tc=6.0 min CN=98 Runoff=3.18 cfs 0.252 af
SubcatchmentR2: ResidentialRoof Area	Runoff Area=13,766 sf 100.00% Impervious Runoff Depth>4.42" Tc=6.0 min CN=98 Runoff=1.47 cfs 0.116 af
SubcatchmentR3: ResidentialRoof Area	Runoff Area=24,176 sf 100.00% Impervious Runoff Depth>4.42" Tc=6.0 min CN=98 Runoff=2.58 cfs 0.204 af

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SubcatchmentR4: ResidentialRoof Area Runoff Area=17,527 sf 100.00% Impervious Runoff Depth>4.42"
Tc=6.0 min CN=98 Runoff=1.87 cfs 0.148 af

SubcatchmentR5: ResidentialGarage Runoff Area=30,070 sf 100.00% Impervious Runoff Depth>4.42"
Tc=6.0 min CN=98 Runoff=3.21 cfs 0.254 af

SubcatchmentR6: Retail Building Roof Runoff Area=11,647 sf 100.00% Impervious Runoff Depth>4.42"
Tc=6.0 min CN=98 Runoff=1.24 cfs 0.098 af

SubcatchmentR7: Retail Garage Top Level Runoff Area=26,205 sf 97.45% Impervious Runoff Depth>4.30"
Tc=6.0 min CN=97 Runoff=2.78 cfs 0.216 af

Reach POA1: POA-1 Inflow=13.62 cfs 1.093 af
Outflow=13.62 cfs 1.093 af

Reach POA2: POA-2 Inflow=0.86 cfs 0.058 af
Outflow=0.86 cfs 0.058 af

Reach POA3: POA-3 Inflow=1.38 cfs 0.093 af
Outflow=1.38 cfs 0.093 af

Pond BASIN1: Infiltration/DetentionBasin Peak Elev=409.89' Storage=5,525 cf Inflow=4.51 cfs 0.348 af
Discarded=0.06 cfs 0.048 af Primary=3.98 cfs 0.193 af Secondary=0.00 cfs 0.000 af Outflow=4.04 cfs 0.241 af

Pond CB1: CB-1 Peak Elev=429.10' Inflow=0.52 cfs 0.038 af
12.0" Round Culvert n=0.013 L=4.0' S=0.0125 '/' Outflow=0.52 cfs 0.038 af

Pond CB10: CB-10 Peak Elev=409.52' Inflow=1.38 cfs 0.093 af
12.0" Round Culvert n=0.013 L=56.0' S=0.0143 '/' Outflow=1.38 cfs 0.093 af

Pond CB2: CB-2 Peak Elev=431.43' Inflow=0.56 cfs 0.040 af
12.0" Round Culvert n=0.013 L=97.0' S=0.0247 '/' Outflow=0.56 cfs 0.040 af

Pond CB3: CB-3 Peak Elev=423.68' Inflow=1.26 cfs 0.092 af
12.0" Round Culvert n=0.013 L=8.0' S=0.0275 '/' Outflow=1.26 cfs 0.092 af

Pond CB4: CB-4 Peak Elev=427.53' Inflow=2.96 cfs 0.301 af
15.0" Round Culvert n=0.013 L=4.0' S=0.0500 '/' Outflow=2.96 cfs 0.301 af

Pond CB5: CB-5 Peak Elev=426.69' Inflow=0.27 cfs 0.021 af
12.0" Round Culvert n=0.013 L=21.0' S=0.0190 '/' Outflow=0.27 cfs 0.021 af

Pond CB6: CB-6 Peak Elev=408.63' Inflow=0.06 cfs 0.004 af
12.0" Round Culvert n=0.013 L=37.0' S=0.0135 '/' Outflow=0.06 cfs 0.004 af

Pond CB7: CB-7 Peak Elev=407.43' Inflow=0.06 cfs 0.004 af
12.0" Round Culvert n=0.013 L=7.0' S=0.0429 '/' Outflow=0.06 cfs 0.004 af

Pond CB8: CB-8 Peak Elev=0.00'
12.0" Round Culvert n=0.013 L=61.0' S=0.0211 '/' Primary=0.00 cfs 0.000 af

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Pond CB9: CB-9

Peak Elev=0.00'
12.0" Round Culvert n=0.013 L=54.0' S=0.0269 '/' Primary=0.00 cfs 0.000 af

Pond DMH10: DMH-10

Peak Elev=426.31' Inflow=3.24 cfs 0.222 af
30.0" Round Culvert n=0.013 L=100.0' S=0.0100 '/' Outflow=3.24 cfs 0.222 af

Pond DMH11: DMH-11

Peak Elev=427.12' Inflow=1.08 cfs 0.078 af
12.0" Round Culvert n=0.013 L=187.0' S=0.0187 '/' Outflow=1.08 cfs 0.078 af

Pond DMH12: DMH-12 (WQU 4)

Peak Elev=422.11' Inflow=2.34 cfs 0.170 af
12.0" Round Culvert n=0.013 L=13.0' S=0.1154 '/' Outflow=2.34 cfs 0.170 af

Pond DMH13: DMH-13

Peak Elev=408.03' Inflow=0.06 cfs 0.004 af
12.0" Round Culvert n=0.013 L=50.0' S=0.0080 '/' Outflow=0.06 cfs 0.004 af

Pond DMH14: DMH-14

Peak Elev=407.69' Inflow=1.49 cfs 0.102 af
12.0" Round Culvert n=0.013 L=4.0' S=0.0250 '/' Outflow=1.49 cfs 0.102 af

Pond DMH15: DMH-15 (WQU 2)

Peak Elev=407.52' Inflow=1.49 cfs 0.102 af
12.0" Round Culvert n=0.013 L=42.0' S=0.0048 '/' Outflow=1.49 cfs 0.102 af

Pond DMH16: DMH-16 (WQU 3)

Peak Elev=426.91' Inflow=3.07 cfs 0.322 af
15.0" Round Culvert n=0.013 L=3.0' S=0.0167 '/' Outflow=3.07 cfs 0.322 af

Pond DMH18: DMH-18 (WQU 5)

Peak Elev=413.09' Inflow=2.78 cfs 0.216 af
15.0" Round Culvert n=0.013 L=26.0' S=0.0231 '/' Outflow=2.78 cfs 0.216 af

Pond DMH1B: DMH-1B (WQU 1)

Peak Elev=431.05' Inflow=3.21 cfs 0.254 af
15.0" Round Culvert n=0.013 L=57.0' S=0.0053 '/' Outflow=3.21 cfs 0.254 af

Pond DMH6: DMH-6

Peak Elev=425.31' Inflow=3.24 cfs 0.222 af
30.0" Round Culvert n=0.013 L=128.0' S=0.0352 '/' Outflow=3.24 cfs 0.222 af

Pond DMH7: DMH-7

Peak Elev=426.98' Inflow=3.07 cfs 0.322 af
15.0" Round Culvert n=0.013 L=8.0' S=0.0187 '/' Outflow=3.07 cfs 0.322 af

Pond DMH8: DMH-8

Peak Elev=426.27' Inflow=0.90 cfs 0.071 af
12.0" Round Culvert n=0.013 L=5.0' S=0.0000 '/' Outflow=0.90 cfs 0.071 af

Pond DMH9: DMH-9

Peak Elev=421.78' Inflow=3.87 cfs 0.470 af
24.0" Round Culvert n=0.013 L=5.0' S=0.0100 '/' Outflow=3.87 cfs 0.470 af

Pond OG1: Oil/Grit Separator

Peak Elev=431.70' Inflow=3.21 cfs 0.254 af
15.0" Round Culvert n=0.013 L=110.0' S=0.0055 '/' Outflow=3.21 cfs 0.254 af

Pond OG2: Oil/Grit Separator

Peak Elev=413.29' Inflow=2.78 cfs 0.216 af
15.0" Round Culvert n=0.013 L=20.0' S=0.0400 '/' Outflow=2.78 cfs 0.216 af

Pond SUB1: Subsurface Infiltration System 1 Peak Elev=431.13' Storage=8,919 cf Inflow=6.39 cfs 0.506 af
Discarded=0.07 cfs 0.067 af Primary=4.82 cfs 0.273 af Outflow=4.89 cfs 0.340 af

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Pond SUB2: Subsurface Infiltration System 2 Peak Elev=430.93' Storage=9,600 cf Inflow=5.97 cfs 0.390 af
Discarded=0.06 cfs 0.050 af Primary=1.39 cfs 0.127 af Outflow=1.45 cfs 0.176 af

Pond SUB3: Subsurface Infiltration System Peak Elev=428.63' Storage=11,836 cf Inflow=2.58 cfs 0.331 af
Discarded=0.07 cfs 0.063 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.063 af

Pond SUB4: Subsurface Infiltration System Peak Elev=426.08' Storage=11,582 cf Inflow=4.71 cfs 0.541 af
Discarded=0.07 cfs 0.064 af Primary=3.24 cfs 0.222 af Outflow=3.32 cfs 0.285 af

Total Runoff Area = 8.882 ac Runoff Volume = 2.546 af Average Runoff Depth = 3.44"
39.48% Pervious = 3.507 ac 60.52% Impervious = 5.375 ac

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Time span=0.00-20.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: SubcatchmentArea 1	Runoff Area=79,040 sf 32.88% Impervious Runoff Depth>6.13" Tc=6.0 min CN=81 Runoff=13.19 cfs 0.927 af
Subcatchment2S: SubcatchmentArea 2	Runoff Area=14,438 sf 9.25% Impervious Runoff Depth>5.30" Tc=6.0 min CN=74 Runoff=2.14 cfs 0.146 af
Subcatchment3S: SubcatchmentArea 3	Runoff Area=19,398 sf 14.17% Impervious Runoff Depth>5.89" Tc=6.0 min CN=79 Runoff=3.14 cfs 0.219 af
Subcatchment4S: SubcatchmentArea 4	Runoff Area=60,923 sf 23.51% Impervious Runoff Depth>5.99" Flow Length=717' Tc=21.7 min CN=80 Runoff=6.69 cfs 0.698 af
Subcatchment5S: SubcatchmentArea 5	Runoff Area=5,871 sf 67.16% Impervious Runoff Depth>7.21" Tc=6.0 min CN=90 Runoff=1.09 cfs 0.081 af
Subcatchment6S: SubcatchmentArea 6	Runoff Area=5,153 sf 77.86% Impervious Runoff Depth>7.57" Tc=6.0 min CN=93 Runoff=0.98 cfs 0.075 af
Subcatchment7S: SubcatchmentArea 7	Runoff Area=12,508 sf 80.51% Impervious Runoff Depth>7.57" Tc=6.0 min CN=93 Runoff=2.37 cfs 0.181 af
Subcatchment8S: Pool Area	Runoff Area=8,443 sf 100.00% Impervious Runoff Depth>8.17" Tc=6.0 min CN=98 Runoff=1.64 cfs 0.132 af
Subcatchment9S: SubcatchmentArea 9	Runoff Area=2,484 sf 100.00% Impervious Runoff Depth>8.17" Tc=6.0 min CN=98 Runoff=0.48 cfs 0.039 af
Subcatchment10S: SubcatchmentArea 10	Runoff Area=18,790 sf 23.20% Impervious Runoff Depth>6.01" Tc=6.0 min CN=80 Runoff=3.09 cfs 0.216 af
Subcatchment11S: SubcatchmentArea 11	Runoff Area=5,635 sf 51.45% Impervious Runoff Depth>6.73" Tc=6.0 min CN=86 Runoff=1.00 cfs 0.073 af
Subcatchment12S: SubcatchmentArea 12	Runoff Area=526 sf 100.00% Impervious Runoff Depth>8.17" Tc=6.0 min CN=98 Runoff=0.10 cfs 0.008 af
Subcatchment13S: SubcatchmentArea 13	Runoff Area=526 sf 100.00% Impervious Runoff Depth>8.17" Tc=6.0 min CN=98 Runoff=0.10 cfs 0.008 af
SubcatchmentR1: ResidentialRoof Area	Runoff Area=29,776 sf 100.00% Impervious Runoff Depth>8.17" Tc=6.0 min CN=98 Runoff=5.77 cfs 0.466 af
SubcatchmentR2: ResidentialRoof Area	Runoff Area=13,766 sf 100.00% Impervious Runoff Depth>8.17" Tc=6.0 min CN=98 Runoff=2.67 cfs 0.215 af
SubcatchmentR3: ResidentialRoof Area	Runoff Area=24,176 sf 100.00% Impervious Runoff Depth>8.17" Tc=6.0 min CN=98 Runoff=4.68 cfs 0.378 af

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SubcatchmentR4: ResidentialRoof Area Runoff Area=17,527 sf 100.00% Impervious Runoff Depth>8.17"
Tc=6.0 min CN=98 Runoff=3.40 cfs 0.274 af

SubcatchmentR5: ResidentialGarage Runoff Area=30,070 sf 100.00% Impervious Runoff Depth>8.17"
Tc=6.0 min CN=98 Runoff=5.83 cfs 0.470 af

SubcatchmentR6: Retail Building Roof Runoff Area=11,647 sf 100.00% Impervious Runoff Depth>8.17"
Tc=6.0 min CN=98 Runoff=2.26 cfs 0.182 af

SubcatchmentR7: Retail Garage Top Level Runoff Area=26,205 sf 97.45% Impervious Runoff Depth>8.05"
Tc=6.0 min CN=97 Runoff=5.06 cfs 0.404 af

Reach POA1: POA-1 Inflow=37.74 cfs 3.419 af
Outflow=37.74 cfs 3.419 af

Reach POA2: POA-2 Inflow=2.14 cfs 0.146 af
Outflow=2.14 cfs 0.146 af

Reach POA3: POA-3 Inflow=3.14 cfs 0.219 af
Outflow=3.14 cfs 0.219 af

Pond BASIN1: Infiltration/DetentionBasin Peak Elev=410.24' Storage=6,414 cf Inflow=8.33 cfs 0.658 af
Discarded=0.06 cfs 0.058 af Primary=6.49 cfs 0.493 af Secondary=0.00 cfs 0.000 af Outflow=6.55 cfs 0.551 af

Pond CB1: CB-1 Peak Elev=429.30' Inflow=0.98 cfs 0.075 af
12.0" Round Culvert n=0.013 L=4.0' S=0.0125 '/' Outflow=0.98 cfs 0.075 af

Pond CB10: CB-10 Peak Elev=410.37' Inflow=3.09 cfs 0.216 af
12.0" Round Culvert n=0.013 L=56.0' S=0.0143 '/' Outflow=3.09 cfs 0.216 af

Pond CB2: CB-2 Peak Elev=431.62' Inflow=1.09 cfs 0.081 af
12.0" Round Culvert n=0.013 L=97.0' S=0.0247 '/' Outflow=1.09 cfs 0.081 af

Pond CB3: CB-3 Peak Elev=424.13' Inflow=2.37 cfs 0.181 af
12.0" Round Culvert n=0.013 L=8.0' S=0.0275 '/' Outflow=2.37 cfs 0.181 af

Pond CB4: CB-4 Peak Elev=429.18' Inflow=6.69 cfs 0.698 af
15.0" Round Culvert n=0.013 L=4.0' S=0.0500 '/' Outflow=6.69 cfs 0.698 af

Pond CB5: CB-5 Peak Elev=426.79' Inflow=0.48 cfs 0.039 af
12.0" Round Culvert n=0.013 L=21.0' S=0.0190 '/' Outflow=0.48 cfs 0.039 af

Pond CB6: CB-6 Peak Elev=408.67' Inflow=0.10 cfs 0.008 af
12.0" Round Culvert n=0.013 L=37.0' S=0.0135 '/' Outflow=0.10 cfs 0.008 af

Pond CB7: CB-7 Peak Elev=407.47' Inflow=0.10 cfs 0.008 af
12.0" Round Culvert n=0.013 L=7.0' S=0.0429 '/' Outflow=0.10 cfs 0.008 af

Pond CB8: CB-8 Peak Elev=0.00'
12.0" Round Culvert n=0.013 L=61.0' S=0.0211 '/' Primary=0.00 cfs 0.000 af

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Pond CB9: CB-9

Peak Elev=0.00'

12.0" Round Culvert n=0.013 L=54.0' S=0.0269 '/' Primary=0.00 cfs 0.000 af

Pond DMH10: DMH-10

Peak Elev=428.06' Inflow=21.34 cfs 1.429 af

30.0" Round Culvert n=0.013 L=100.0' S=0.0100 '/' Outflow=21.34 cfs 1.429 af

Pond DMH11: DMH-11

Peak Elev=427.47' Inflow=2.07 cfs 0.156 af

12.0" Round Culvert n=0.013 L=187.0' S=0.0187 '/' Outflow=2.07 cfs 0.156 af

Pond DMH12: DMH-12 (WQU 4)

Peak Elev=423.70' Inflow=4.44 cfs 0.337 af

12.0" Round Culvert n=0.013 L=13.0' S=0.1154 '/' Outflow=4.44 cfs 0.337 af

Pond DMH13: DMH-13

Peak Elev=408.07' Inflow=0.10 cfs 0.008 af

12.0" Round Culvert n=0.013 L=50.0' S=0.0080 '/' Outflow=0.10 cfs 0.008 af

Pond DMH14: DMH-14

Peak Elev=408.61' Inflow=3.29 cfs 0.233 af

12.0" Round Culvert n=0.013 L=4.0' S=0.0250 '/' Outflow=3.29 cfs 0.233 af

Pond DMH15: DMH-15 (WQU 2)

Peak Elev=408.41' Inflow=3.29 cfs 0.233 af

12.0" Round Culvert n=0.013 L=42.0' S=0.0048 '/' Outflow=3.29 cfs 0.233 af

Pond DMH16: DMH-16 (WQU 3)

Peak Elev=428.55' Inflow=6.89 cfs 0.737 af

15.0" Round Culvert n=0.013 L=3.0' S=0.0167 '/' Outflow=6.89 cfs 0.737 af

Pond DMH18: DMH-18 (WQU 5)

Peak Elev=413.90' Inflow=5.06 cfs 0.404 af

15.0" Round Culvert n=0.013 L=26.0' S=0.0231 '/' Outflow=5.06 cfs 0.404 af

Pond DMH1B: DMH-1B (WQU 1)

Peak Elev=432.08' Inflow=5.83 cfs 0.470 af

15.0" Round Culvert n=0.013 L=57.0' S=0.0053 '/' Outflow=5.83 cfs 0.470 af

Pond DMH6: DMH-6

Peak Elev=427.06' Inflow=21.34 cfs 1.429 af

30.0" Round Culvert n=0.013 L=128.0' S=0.0352 '/' Outflow=21.34 cfs 1.429 af

Pond DMH7: DMH-7

Peak Elev=428.70' Inflow=6.89 cfs 0.737 af

15.0" Round Culvert n=0.013 L=8.0' S=0.0187 '/' Outflow=6.89 cfs 0.737 af

Pond DMH8: DMH-8

Peak Elev=426.55' Inflow=1.64 cfs 0.132 af

12.0" Round Culvert n=0.013 L=5.0' S=0.0000 '/' Outflow=1.64 cfs 0.132 af

Pond DMH9: DMH-9

Peak Elev=422.40' Inflow=8.36 cfs 1.011 af

24.0" Round Culvert n=0.013 L=5.0' S=0.0100 '/' Outflow=8.36 cfs 1.011 af

Pond OG1: Oil/Grit Separator

Peak Elev=432.81' Inflow=5.83 cfs 0.470 af

15.0" Round Culvert n=0.013 L=110.0' S=0.0055 '/' Outflow=5.83 cfs 0.470 af

Pond OG2: Oil/Grit Separator

Peak Elev=414.10' Inflow=5.06 cfs 0.404 af

15.0" Round Culvert n=0.013 L=20.0' S=0.0400 '/' Outflow=5.06 cfs 0.404 af

Pond SUB1: Subsurface Infiltration

Peak Elev=431.71' Storage=10,395 cf Inflow=11.60 cfs 0.936 af

Discarded=0.08 cfs 0.077 af Primary=9.36 cfs 0.692 af Outflow=9.43 cfs 0.769 af

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Pond SUB2: Subsurface Infiltration Peak Elev=431.65' Storage=10,378 cf Inflow=11.55 cfs 0.907 af
Discarded=0.06 cfs 0.056 af Primary=11.46 cfs 0.637 af Outflow=11.52 cfs 0.693 af

Pond SUB3: Subsurface Infiltration Peak Elev=430.69' Storage=15,203 cf Inflow=15.44 cfs 1.015 af
Discarded=0.10 cfs 0.082 af Primary=12.31 cfs 0.616 af Outflow=12.41 cfs 0.698 af

Pond SUB4: Subsurface Infiltration System Peak Elev=426.52' Storage=12,104 cf Inflow=9.58 cfs 1.143 af
Discarded=0.08 cfs 0.073 af Primary=9.36 cfs 0.813 af Outflow=9.44 cfs 0.886 af

Total Runoff Area = 8.882 ac Runoff Volume = 5.192 af Average Runoff Depth = 7.02"
39.48% Pervious = 3.507 ac 60.52% Impervious = 5.375 ac

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Stage-Area-Storage for Pond BASIN1: Infiltration/Detention Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
406.00	623	0	411.20	3,232	9,207
406.10	655	64	411.30	3,298	9,534
406.20	687	131	411.40	3,365	9,867
406.30	720	201	411.50	3,432	10,206
406.40	754	275	411.60	3,499	10,553
406.50	789	352	411.70	3,568	10,906
406.60	825	433			
406.70	861	517			
406.80	898	605			
406.90	936	697			
407.00	975	792			
407.10	1,014	892			
407.20	1,054	995			
407.30	1,095	1,103			
407.40	1,136	1,214			
407.50	1,178	1,330			
407.60	1,221	1,450			
407.70	1,265	1,574			
407.80	1,310	1,703			
407.90	1,355	1,836			
408.00	1,401	1,974			
408.10	1,447	2,116			
408.20	1,494	2,264			
408.30	1,542	2,415			
408.40	1,591	2,572			
408.50	1,640	2,734			
408.60	1,690	2,900			
408.70	1,741	3,072			
408.80	1,793	3,248			
408.90	1,845	3,430			
409.00	1,898	3,617			
409.10	1,952	3,810			
409.20	2,006	4,008			
409.30	2,061	4,211			
409.40	2,117	4,420			
409.50	2,174	4,634			
409.60	2,231	4,855			
409.70	2,289	5,081			
409.80	2,348	5,312			
409.90	2,408	5,550			
410.00	2,468	5,794			
410.10	2,528	6,044			
410.20	2,589	6,300			
410.30	2,651	6,562			
410.40	2,713	6,830			
410.50	2,776	7,104			
410.60	2,840	7,385			
410.70	2,905	7,672			
410.80	2,970	7,966			
410.90	3,036	8,267			
411.00	3,103	8,573			
411.10	3,167	8,887			

Village at Grafton Woods Stormwater Calculations – Revised Surface Basin Calculations

Required Recharge Volume (Standard 3):

Infiltration/Detention Basin:

For Class C Soils: F = Target depth factor = 0.25 inch

Impervious Area = 0.86 acre

$Rv_0 = F * \text{Impervious Area}$

$Rv_0 = 0.25 \text{ inches} \times 0.86 \text{ acres} \times 1 \text{ ft} / 12'' \times 43,560 \text{ sf} / \text{acre} = 780 \text{ cf}$

Volume provided below lowest outlet, Infiltration/Detention Basin: 4,634 ft³

Groundwater Recharge Time and Drawdown

Infiltration occurs in the surface basin. The basin is required to dewater the required recharge volume within 72-hours. The following Equation from the Massachusetts Stormwater Handbook was calculated using the basin volumes:

Infiltration/Detention Basin:

$$Time_{drawdown} = \frac{V_s}{(K)(\text{Bottom Area})}$$

$V_s = \text{Storage (Required Recharge) Volume} = 780 \text{ ft}^3$

$K = 0.0225 \text{ ft/hr (0.27 in/hr Rawls Rate)}$

$\text{Bottom Area} = 623 \text{ ft}^2 \text{ at elev. 406}$

$$Time_{drawdown} = 780 \text{ cf} / [(0.0225 \text{ ft} / \text{hr})(623 \text{ sf})] = 56 \text{ hours}$$

Required Water Quality Volume (Standard 4):

The Site is considered a LUHPPL, which requires a Water Quality Depth = $D_{WQ1} = 1''$. Additionally, building rooftop areas (not including parking garage surfaces) have been excluded from the calculations as they are not subject to treatment requirements.

LUHPPL impervious area excluding building rooftop = 0.6 acres

$$V_{WQ} = D_{WQ} * \text{Impervious Area} = 1'' \times 1 \text{ ft} / 12'' \times 0.6 \text{ acres} \times 43,560 \text{ sf} / \text{acre} = 2,178 \text{ cf}$$

Volume provided below lowest basin outlet, Infiltration/Detention Basin: 4,634 ft³